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ABSTRACT

The determinants of fertility and attempts to extract conclusions that are relevant for fertility reduction policies in developing countries are investigated. The paper suggests that socioeconomic development has a decisive effect in lowering fertility in the long run but in the short run, and for specific households, the effect is not as conclusive. The study suggests that education, especially for women, fairly reliably reduces fertility, though its effect may take years to appear. Improved health and lower mortality also contribute to lower fertility, through both biological and behavioral channels. The effect of female employment, in contrast, is uncertain and undependable. Other determinants, i.e., fertility behaviors such as later marriage, longer breastfeeding, and more frequent fertility regulation through contraception or abortion, are explored. Cross-national patterns and trends for each of these behaviors are summarized. Specific programs to raise women's status and delay marriage, to educate people about breastfeeding and to make it more convenient, and to apply safe and effective contraception are explored and evaluated. (RSL)

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Reducing Fertility in Developing Countries

A Review of Determinants and Policy Levers

Rodolfo A. Bulatao

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Number 5

Reducing Fertility in Developing Countries

A Review of Determinants and Policy Levers

Rodolfo A. Bulatao

The World Bank
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Rodolfo A. Bulatao, a consultant at the East-West Population Institute (Honolulu, Hawaii), was a member of the core team who prepared *World Development Report 1984.*

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FOREWORD

This paper is one in a special series of World Bank Staff Working Papers on population change and development. Prepared as background papers for the World Development Report 1984, they provide more detailed treatment and documentation of the issues dealt with in Part II of the Report. The papers cover a range of topics, including the effects of population growth and change on economic development, the determinants of fertility and mortality, the links between population growth and internal and international migration, and the management, financing, and effectiveness of family planning programs. They include several country and regional studies of fertility change and population policy.

The background papers draw on a large number of published and unpublished studies of individual researchers, on Bank policy analysis and research, and on reports of other organizations working on population and development programs and issues. The papers are the work of individuals and the views and interpretations expressed in them do not necessarily coincide with the views and interpretations of the Report itself.

I hope these detailed studies will supplement the World Development Report 1984 in furthering understanding of population and development issues among students and practitioners of development.

Nancy Birdsall
Staff Director
World Development Report 1984

Some of the Papers in the Population and Development Series

Ainsworth, Martha. Family Planning Programs: The Clients' Perspective. World Bank Staff Working Paper no. 676.

Boulier, Bryan L. Evaluating Unmet Need for Contraception: Estimates for Thirty-six Developing Countries. World Bank Staff Working Paper no. 678.

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Zachariah, K.C. The Anomoly of the Fertility Decline in India's Kerala State: A Field Investigation. World Bank Staff Working Paper no. 700.

Abstract

This paper reviews the determinants of fertility and attempts to extract conclusions that are relevant for fertility reduction policies in developing countries.

In the first tier of fertility determinants, socioeconomic development has a decisive effect in lowering fertility in the long run. In the short run, however, and for specific households, the effects are much more tangled. Higher income, for instance, allows households to afford more children, but nevertheless often reduces fertility because of its links to other factors like education. Education, especially for women, fairly reliably reduces fertility, though its effect may take years to appear. Improved health and lower mortality also contribute to lower fertility, through both biological and behavioral channels. The effect of female employment, in contrast, is uncertain and undependable. Urban residence has a pervasive effect in reducing fertility, though much of this is attributable to education and better health. Particular improvements in welfare can therefore be expected to lead to lower fertility, but the effects are neither uniform nor immediate.

The occasionally contradictory effects of the development factors are partly due to the effects of the second tier of fertility determinants, labeled here fertility behaviors. Later marriage, longer breastfeeding, and more frequent fertility regulation through contraception or abortion reduce fertility because they reduce exposure to the risk of conception or the likelihood of its occurrence. Marriage delay and reductions in breastfeeding have roughly offsetting effects early in fertility transition, whereas contraception and abortion lead to large fertility reductions later. Cross-national patterns and trends for each of these behaviors are summarized, and determinants discussed. The effects of socioeconomic factors on these behaviors are consistent with and help explain the links between development and fertility decline.

Development is essential for fertility transition to run its full course. In addition, however, specific programs to raise women's status and delay marriage, to educate people about breastfeeding and to make it more convenient, and to apply safe and effective contraception can accelerate transition. Although comparisons of fertility effects suggest that family planning programs are more cost-effective than education or health promotion, choice is not really the issue, since these interventions are complementary.

Condensé

Cette étude examine les éléments qui déterminent la fécondité et les efforts en vue de tirer des conclusions pour l'élaboration de politiques susceptibles de favoriser une baisse de la fécondité dans les pays en développement.

Parmi la première série de facteurs déterminants, le développement socio-économique contribue de façon décisive à un recul durable de la fécondité. En revanche, à court terme, et pour certains ménages particuliers, les effets sont beaucoup moins clairs. Par exemple, un revenu plus élevé donne les moyens à une famille d'élever plus d'enfants et, pourtant, il se traduit souvent par une baisse de la fécondité du fait de ses liens avec d'autres facteurs tels que l'éducation. Celle-ci, en particulier chez les femmes, s'accompagne assez régulièrement d'une baisse de la fécondité, quoique ses effets mettent souvent des années à se faire sentir. Les progrès de la santé et l'abaissement de la mortalité contribuent également à diminuer la fécondité par leur influence sur le plan biologique et sur le plan du comportement. Par contre, les conséquences de l'exercice par les femmes d'une activité rémunérée sont incertaines et sujettes à caution. Le fait d'habiter en ville se traduit presque automatiquement par une baisse de la fécondité, mais celle-ci est due en grande partie à l'éducation et à une meilleure santé. Autrement dit, on peut s'attendre que l'amélioration des conditions sociales entraîne une baisse de la fécondité, encore que ses effets ne soient ni uniformes ni immédiats.

Les effets parfois contradictoires du développement sont liés en partie à ceux de la deuxième série d'éléments déterminants de la fécondité, appelés dans cette étude facteurs de comportement. Un mariage plus tardif, une plus longue période d'allaitement et une régulation plus fréquente de la fécondité par la contraception ou l'avortement font baisser la fécondité parce qu'ils réduisent la durée d'exposition au risque de conception ou la probabilité que celle-ci se produise. Au début, un mariage tardif et la réduction de la période d'allaitement ont plus ou moins des effets qui se compensent sur l'évolution de la fécondité, tandis que, par la suite, la contraception et l'avortement entraînent une forte baisse de la fécondité. Cette étude résume les caractéristiques et les tendances nationales vis-à-vis de chacun de ces comportements et en examine les facteurs déterminants. Les effets des facteurs socio-économiques conditionnant ces comportements confirment et aident à expliquer l'existence de liens entre le développement et la baisse de la fécondité.

Aucune politique cherchant à abaisser la fécondité ne peut aboutir pleinement sans le développement. Toutefois, certains programmes spécifiques destinés à faire progresser la femme dans la société et à retarder le mariage, à éduquer les populations à propos de l'allaitement et à rendre celui-ci plus pratique, et à faire appliquer des méthodes contraceptives sûres et efficaces peuvent accélérer ce processus. Bien que des comparaisons des effets sur la fécondité tendent à indiquer que les programmes de planning familial ont un meilleur rapport coûtefficacité que l'éducation ou la promotion de la santé, la question de choix ne se pose pas vraiment car ces interventions sont complémentaires.

Extracto

En este documento se examinan los factores determinantes de la fecundidad y se intenta extraer conclusiones pertinentes para las políticas de reducción de la fecundidad en los países en desarrollo.

En la primera serie de factores determinantes de la fecundidad, el desarrollo socieconómico tiene un efecto decisivo para disminuir la fecundidad a largo plazo. Sin embargo, a corto plazo y para unidades familiares específicas, los efectos son mucho más complicados. Por ejemplo, los ingresos más elevados permiten a las familias tener más hijos, pero a menudo reducen la fecundidad debido a sus vinculaciones con otros factores como la educación. La educación, especialmente de las mujeres, con bastante seguridad disminuye la fecundidad, aunque su efecto puede tardar años en aparecer. La mejor salud y la mortalidad más baja también contribuyen a la menor fecundidad, a través de medios tanto biológicos como de comportamiento. Por contraste, el efecto del empleo de las mujeres es incierto y poco confiable. La residencia urbana tiene un efecto generalizado en reducir la fecundidad, aunque mucho de ello se atribuye a la educación y la mejor salud. Por consiguiente, se puede prever que determinados mejoramientos en el bienestar conducirán a una menor fecundidad, pero los efectos no son uniformes ni inmediatos.

Los efectos ocasionalmente contradictorios de los factores del desarrollo se deben en parte a los efectos de la segunda serie de factores determinantes de la fecundidad, que en este documento de denominan comportamientos de fecundidad. El aplazamiento de los matrimonios, la lactancia más prolongada y la regulación más frecuente de la fecundidad mediante los anticonceptivos o el aborto reducen la fecundidad porque disminuyen el riesgo de concebir o las probabilidades de que ocurra. El aplazamiento de los matrimonios y la disminución del período de lactancia tienen efectos aproximadamente compensatorios al principiar la transición de la fecundidad, en tanto que los anticonceptivos y el aborto llevan a considerables reducciones de la fecundidad posteriormente. Se resumen las pautas y tendencias de los países con respecto a cada uno de estos comportamientos y se analizan los factores determinantes. Las repercusiones de los factores socioeconómicos en estos comportamientos son coherentes con las vinculaciones entre el desarrollo y la disminución de la fecundidad y ayudan a explicarlas.

El desarrollo es esencial para que la transición de la fecundidad siga su curso completo. Pero también los programas específicos para elevar la condición de las mujeres y aplazar los matrimonios, educar a las personas acerca de la lactancia y hacerla más conveniente, y aplicar métodos anticonceptivos seguros y eficaces, pueden acelerar la transición. Aunque las comparaciones de los efectos de la fecundidad sugieren que los programas de planificación familiar son más eficaces en función de los costos que la educación o el fomento de la salud, la elección no es realmente el problema puesto que estas intervenciones son complementarias.

Acknowledgments

This paper draws heavily upon my previous work with the National Academy of Sciences' Panel of Fertility Determinants, summarized in the two volumes entitled Determinants of Fertility in Developing Countries (Bulatao and Lee with Hollerbach and Bongaarts, eds., 1983). I am therefore indebted to the contributors to these volumes. Many reviewers, both within and outside the Bank, provided comments on one version or another of this paper; Althea Hill and Timothy King provided especially detailed and useful critiques. None of them bears responsibility for this version.

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INTRODUCTION

Transitions from high to low fertility are in progress in 40 or so developing countries or territories. In the historical perspective, these transitions are rapid. Whereas a decline of one birth per woman every thirty years was typical for the European countries during their transitions (Mason and others, 1983), a decline of one birth per woman every six years has been recorded for South Korea, and a few other developing countries have recorded even faster declines (Bulatao and Elwan, 1984).

Fertility still remains high in many areas of the developing world, however, and in a significant number of countries fertility decline has not begun. National total fertility rates are virtually all above 5.0 in Africa and the Middle East. Total fertility does fall below this more frequently in other regions, but in the majority of developing countries rates in rural areas still exceed 5.0 (World Bank, 1983; Casterline and others, 1983). It is uncertain also whether current fertility declines will proceed smoothly in the future. For the European countries it has been observed that, once marital fertility fell at least 10 percent, continuing decline was inevitable until low fertility close to replacement levels was reached. Such a statement would be premature for developing countries. Some countries show evidence of stalled decline, with total fertility still several points above replacement. Although much has been accomplished in bringing fertility down toward sustainable levels, much remains to be done.

This paper surveys the possibilities for action to start or to maintain a fertility decline. It reviews the determinants of fertility, both socioeconomic and biosocial, and comments on the role of government action in affecting them. The focus is on broad policies for the developing world, and no single society will be explored in any depth.

This introductory section provides an impressionistic sketch of the basic argument, introducing the main classes of determinants and policy variables.

The High-fertility Setting

High fertility exists, in traditional settings, because of its social and economic benefits, but persists, once the transition to modernity has begun, often out of social inertia despite declining benefits. In a traditional setting, high fertility logically accompanies high mortality. Many births are needed to ensure a sufficient number of surviving children, in some countries like Afghanistan, but high birth rates continue, in other countries like Morocco, even as this rationale breaks down. In Afghanistan, life expectancy is only 37, and the total fertility rate of 6.9 (World Bank, 1983) leaves the average couple with only four children who will survive to age 20. The total fertility rate is the same in Morocco, but life expectancy is 57, and the average couple therefore has five-and-a-half children surviving to age 20 (see Bongaarts and Menken, 1983; a stable population is assumed).

The traditional ideal of a large family also rests on the many contributions children make to the household economy. A description of a Chinese village in 1948 gives this account of parental reasoning:

> When a son is born, even to a poor family, he is not looked upon as someone who will further divide the family's land, but as one who will add to it. When a second son is born, the parents do not worry that their small piece of land will be divided into two parts. Instead, they begin to

> hope that when their sons are grown up, one will be a hired labourer, another a mason, and they will earn not only their own living but add fifty dollars or so to the family every year. In two or three years, they can buy one more mou of land with their savings. Thus, when the parents are old, they will be better off than they are now (Yang, 1948:84, cited in Caldwell, 1982:167).

Reasoning like this is widespread in developing countries: in two small studies in Ghana, over 60 percent of parents cited economic and practical help as the chief advantage of having children, and even in somewhat more developed countries like Indonesia and the Philippines over 50 percent still cited this advantage (Bulatao, 1979:68). In the absence of alternative investments peasants can rely on, children may provide the only means of ensuring against debility and other risks (Vlassoff and Vlassoff, 1980; Cain, 1981, 1982). They also add to the size and potential connections of the kin group, increasing its strength (Caldwell, 1983).

How convincing are such arguments for large families? It will be argued below that child labor in fact seldom compensates for the cost of childrearing, and that the security children provide may also be an insufficient motive. It is clear, however, that a child is much more of an economic asset--or much less of an economic liability--in less developed than in more developed settings. Combined with the social and psychological benefits the parents receive, this is probably what makes a large family reasonable in a traditional setting.

Thus parity-specific fertility regulation is almost completely absent in traditional settings, a situation that demographers label "natural fertility" (Henry, 1953). Nevertheless, families are seldom extremely large. Prolonged breastfeeding and postpartum abstinence ensure some spacing between births, and in some places high sterility levels also limit fertility. As already noted, high levels of infant and child mortality also leave relatively few survivors. These constraints on family size ensure that many couples, perhaps the majority, will have fewer children than they would prefer (Easterlin, 1975).

Fertility Transition

High fertility in the modern world may be seen as a symptom of lack of access: lack of access to health services, which would reduce the need to insure against infant and child mortality by having many births; lack of access to education, which could take children off the farm, reducing their immediate labor value, and which could also broaden a woman's outlook and give her some degree of control over her life; lack of access to social security and forms of insurance for old age, including landownership, that might replace children; lack of access to consumer goods and social opportunities that compete with childrearing; lack of access to the media, which promote such goods and often support modern values and the idea of personal control; and lack of access to family planning services, which provide the means to limit births.

As individuals gain access to services and opportunities, the high-fertility system breaks down in ways that can be crudely sketched. With growing urbanization, more and more children are taken off the farm and placed in settings where their labor is of less value. Urbanization also breaks up kin groups and reduces reliance on children, who go off to seek their fortunes elsewhere. Private pensions and social security substitute for dependence on children in old age. Urban growth feeds technological change, which in turn requires an increasingly educated labor force, raising the costs of childrearing and reducing the utility of child labor. Rising education levels are self-reinforcing, with more educated women postponing marriage and seeking more education for their own children, when they do marry, and possibly beginning to consider limiting their families to be able to afford childrearng costs. In addition, another important change is taking place in parental outlooks. Where the family was previously the center of peoples' lives, the broader exposure provided by education, the influence of the media, and the force of advertising, coupled with rising incomes, open possibilities for other forms of entertainment, enjoyment, and fulfillment. What used to be seen as the blessings of a large family become increasingly burdensome, especially for women, as new goods which one might otherwise be able to purchase multiply. Among these new goods are the means to plan one's births, and once these interlinked processes have progressed far enough and the idea of planning births is no longer unthinkable, contraception spreads, and the road to lower fertility is open.

This sketch of the processes underlying fertility transition incorporates elements from many different accounts. Three key sets of elements are worth notice. One of these is the value and cost of children to parents. The net economic value of children is continually undermined in the development process, first by child labor becoming less economical and then by a dramatic rise in the opportunity costs of childrearing, as parents--and women especially--increasingly come to value their own comfort and freedom. Would these changes be sufficient by themselves to bring about the fertility transition? This is probably the case in the long run, since households could not long bear the costs of large numbers of children if they were prohibitively expensive.

However, in developing countries these changes always go together with, and possibly generate and are reinforced by, the increasing availability of methods to regulate fertility. This is the second key element in the sketch above. The contribution of contraceptive availability to fertility transition has been much debated. It has been argued, on the one hand, that a contraceptive method like withdrawal is always available, and that the absence of modern contraceptives and family planning programs can therefore never be a bar to fertility reduction. Withdrawal and rhythm, in fact, continue to be the major methods in use in several Eastern European countries that have completed fertility transition. On the other hand, accumulating research evidence, to be reviewed further below, shows that making modern contraceptives readily available leads to their wider use, and that family planning programs therefore have an independent impact on fertility reduction. Apart from the technology of fertility control, the very idea of the possibility of such control is critical in fertility transition.

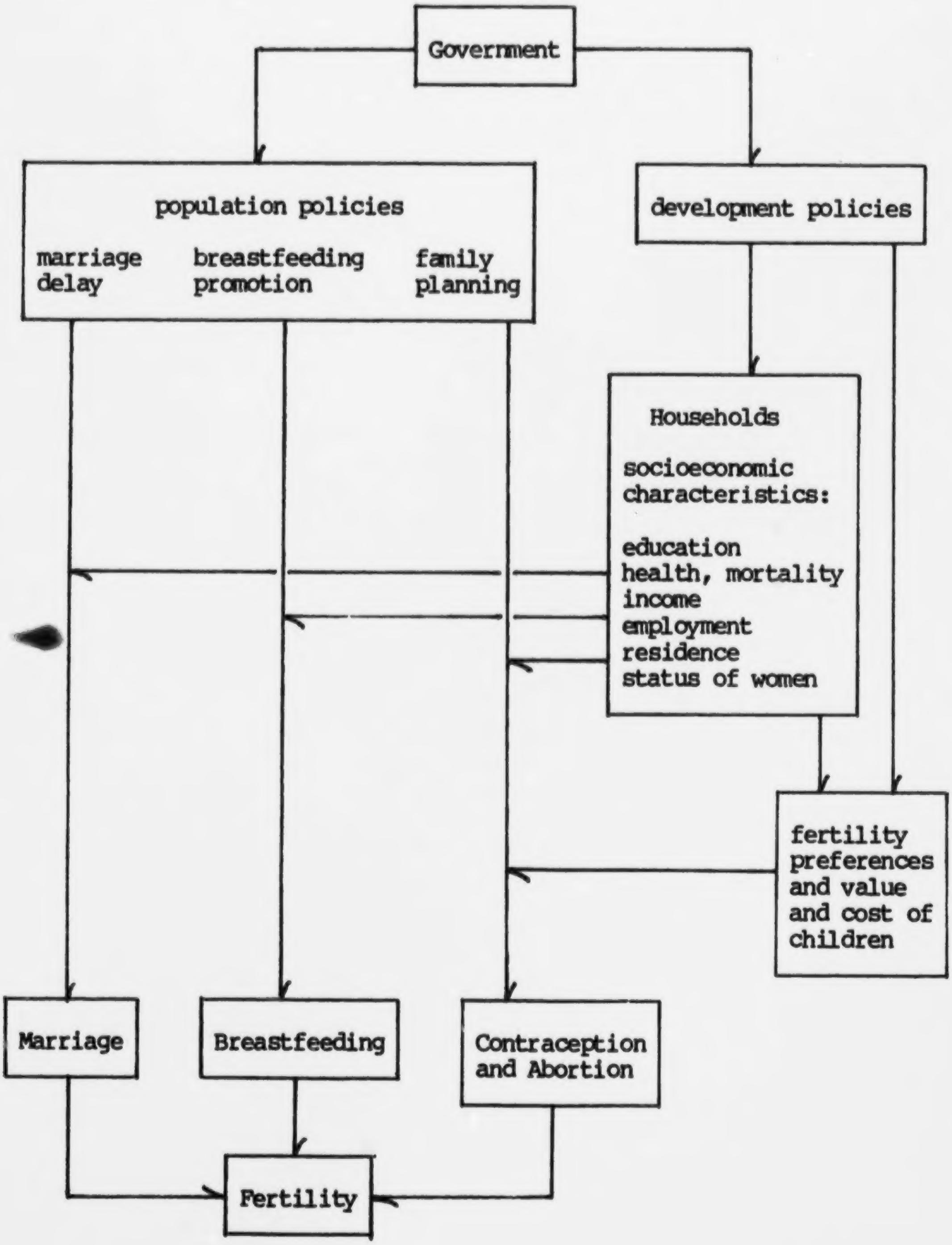
A third key set of elements involves changes in mortality levels and marriage age. Both of these factors affect fertility not by affecting personal decisions about family size or fertility control but by modifying opportunity or capability to reproduce. One other such factor is breastfeeding, which has a large and until recently relatively unappreciated impact on fertility levels.

Each of these key sets of elements is modified in the course of socioeconomic development. Many aspects of development are cited in the sketch, including education, urbanization, media expansion, and new goods. Other elements might be added, like the shift from agriculture to industry and the growth of modern-sector jobs for women.

A framework incorporating all these key elements and the policy levers for affecting them is shown in Figure 1. Three types of fertility behavior directly determine fertility outcomes: marriage timing, breastfeeding duration, and the practice of contraception and abortion. These behaviors may be affected directly through population policies and programs, including family planning programs. They may also be affected indirectly through development policies and programs that change the socioeconomic characteristics of households, and therefore the propensities and decisions of their members with regard to each type of behavior.

In the course of fertility transition, the typical family is transformed from an agricultural household with six or so children, and often other assorted relatives, to an urban, nuclear household with two children. How do the reductions in number of children affect the welfare of the transitional families that are progressively smaller in size? When the continuing reductions are motivated by changes in the value and cost of children, families are presumably maximizing their net gains in choosing progressively fewer children. This is not to say that nothing of worth is lost. Cultural patterns tied to large families are eroded, and personalistic modes of relationship are replaced by relationships based on universalism, individualism, and other values central to modern life (e.g., Kahl, 1968). Nevertheless, just as people everywhere appear to choose to become modern (Lerner, 1958), so they everywhere eventually choose to have smaller families. For particular couples the choice may be difficult, but in the long run it is essentially no contest. Pronatalism draws its strongest support from a setting of deprivation and poverty (Birdsall, 1980), in which children provide essential labor and security and are an irreplaceable source of enjoyment. That many couples turn their backs on large families, as

Figure 1 Socioeconomic and behavioral determinants of fertility and policies that affect them


Government
population policies
marriage delay
breastfeeding promotion
family planning
development policies
Households
socioeconomic characteristics:
education
health, mortality
income
employment
residence
status of women
fertility preferences and value and cost of children
Marriage
Breastfeeding
Contraception and Abortion
Fertility

alternative opportunities for advancement present themselves, is hardly surprising.

The transition from high to low fertility in Europe took place largely because couples made small-family choices and learned to implement them. Their governments had little influence on their decisions. In developing countries today, by contrast, many governments are gravely concerned about couples' fertility decisions and often try to intervene on the side of smaller families. The basis for this concern lies in the difficulties governments face in meeting many of their core responsibilities--such as providing education, jobs, housing, and public facilities--if population grows too fast. Furthermore, although parents may enjoy various advantages from high fertility, children are often worse off. Large families mean a greater risk of malnutrition, disease, and death, and are usually associated with more cursory parental care and little attention to children's education. Government intervention to reduce fertility, therefore, serves the societal objective of moderating population growth and improves the prospects for succeeding generations.

As the sketch above suggests, development is the long-run answer to fertility reduction. However, researchers have so far failed to find any development level or any cluster of development factors that automatically triggers fertility decline. In the short term, furthermore, development has a multiplicity of effects on fertility, not all of them leading to fertility reduction. Thus the fertility effects of different development factors require careful consideration in the next section.

DEVELOPMENT AND FERTILITY

Development involves changes in many interrelated aspects of life. These aspects will be examined for their effects on fertility: income and wealth, education, health and mortality, employment, urban vs. rural residence, and the status of women. The specific package of development measures with the greatest potential for reducing fertility will vary from place to place. Nevertheless, some general observations can be made about the potential fertility effects of improvements in each of these broad areas.

Income: Pure vs. Indirect Effects

Income affects fertility in many ways, both direct and indirect, and studies can be found to show either positive or negative effects. The majority of studies that compare countries find that fertility declines as income rises. The majority of studies that compare households within countries and obtain significant results find that fertility rises as income rises (Mueller and Short, 1983:608-614).

Theoretical analysis suggests that the pure income effect is likely to be positive. Children draw on household resources and provide various rewards, many of which are difficult to obtain in any other way; those with more money, therefore, can better afford the satisfactions children provide (see Turchi, 1975, re the possibility that children are inferior goods). This pure effect is more likely to be observed in household studies, where more variables can be controlled and samples are more homogeneous. In cross-national studies, the fewer controls possible make it more difficult to exclude indirect effects, whether negative or positive. Indirect effects also take longer to appear and should therefore be more visible across countries (Simon, 1975).

Among indirect income effects are the following.

- Higher income may lead to more spending on children's education, and therefore fewer children. It may also lead to more spending for children's consumption, and for other things that produce child "quality," with the same effect. It has been demonstrated that the fertility effect of increased investments in children's education at higher income levels offsets the fertility effect of income gains in developed countries, leading to lower fertility (Becker and Lewis, 1973; Willis, 1974; DeTray, 1972). For developing countries, however, the evidence is ambiguous. Increases in amount spent on childbearing appear to be roughly offset by increases in ability to pay (Mueller, 1972; Arnold and others, 1975).
- Higher income makes available substitutes for children's economic contributions. It means an increased surplus to invest in land or some other asset, declining information costs regarding alternative investments, and increased access to social security and welfare mechanisms to guard against destitution. The reduced economic contributions from children at higher income levels (Mueller, 1972; Caldwell, 1978; Bulatao, 1979) should mean a reduced demand for children.
- In many settings, a woman does not work outside the home if her husband's income permits it. Higher income would therefore increase the likelihood of the wife's staying at home, reducing possible conflict with and possibly increasing the motivation to care for many children.

- Rising incomes should increase exposure to consumer goods, reducing the propensity of couples to spend disposable income on children (Freedman, 1970, 1976; Bulatao, 1982). The acquisition of watches, bicycles, TV sets, better medical care, and better schooling by higher-income urban families induces a felt need for these goods among other families, promoting reduction in fertility.
- Rising incomes should improve nutrition and health care and contribute to lower infant and child mortality, which may in turn affect fertility. Rising incomes are also often associated with decreased breastfeeding, with possibly substantial positive effects on fertility.
- Higher income should mean better ability to afford contraception and abortion. Income is commonly associated with greater use of both, with negative effect on fertility.
- Where the need for a dowry or bride-price, or the cost of setting up a new household, are obstacles that tend to delay marriage, rising incomes should permit earlier marriage and earlier childbearing, and therefore higher fertility.

This listing does not exhaust the indirect effects of income. For instance, the source of any additional income also makes a difference. If income rises as a result of improvements in human capital, this may have negative effects on fertility through increasing the opportunity costs of childrearing. Given this tangled web of relationships, it is easy to see that the total income effect could be either positive or negative.

To rely on rising incomes to lead to fertility control is clearly a deficient strategy, since in particular circumstances rising incomes could instead increase fertility. In the long run, as societal comparisons suggest, higher incomes and the associated societal changes should eventually mean lower fertility. In the short run, for individual households, extra income might instead be spent to support additional children. In some household studies, in fact, income has a positive effect on fertility up to some threshold income level, before its effect turns negative (Encarnacion, 1974; Canlas, 1978; Repetto, 1979; Chernichovsky and Meesook, 1981).

To avoid the short-run pronatal effects of increased income, it is desirable to focus on substantial long-term income improvements rather than on transitory cash infusions. It is also desirable to emphasize several of the indirect income effects, many of which are negative. Concretely, this might mean emphasizing education, which has a particular link to aspirations for children, access to contraception, and other antinatal factors classified under indirect effects of income. The evidence concerning the fertility effect of education will be considered shortly. It might also mean emphasizing landownership rather than farm size, given the relationship of farm size to higher fertility and landownership to lower fertility (Stokes and Schutjer, 1983). Finally, it might mean specific educational and service programs to break some of the positive links between income and fertility, such as attempts to limit breastfeeding declines.

The suggestion is sometimes made that improving income distribution in a society will reduce fertility. High fertility in Pakistan and the Philippines, for instance, may be partly associated with income inequality, whereas low fertility in Cuba and Costa Rica may be associated with greater equality (Repetto, 1979). Hypothetically, there are two main ways greater income equality could reduce fertility. First, assume that an increase in income from low levels will lower fertility, whereas an increase from high levels will have little effect on or will actually raise fertility. This has not been proved and does not apply in some cases, but if it is true, and if poor households are at low income levels and rich households are at high levels, greater income equality should reduce fertility (Repetto, 1979). Second, more homogeneity and more equality in a society may facilitate the spread of attitudes and practices that will lower fertility (Retherford, 1979; Repetto, 1979). (A third effect, the relative income effect, could arguably go in either direction.) Whether these arguments are in fact correct is not certain, and given the complexity of the effects of income, it should not be surprising that firm conclusions cannot be drawn (Mueller and Short, 1983:Table 4). Studies suggests, in very tentative fashion, that reducing inequality may increase fertility in low-income, traditional populations with high mortality, but reduce fertility in more progressive and affluent populations with lower mortality (Winegarden, 1980, 1981; and other studies cited by Mueller and Short, 1983).

Much depends, of course, on how income redistribution is achieved, whether through land redistribution, tax schemes, welfare programs, or other measures. Any attempts to raise living standards among the poor will have many other effects--probably more important--on fertility.

Education: Lags in Antinatal Impact

Like income, education affects fertility through a variety of channels. Unlike income, education is more consistent in its effects, being more likely to reduce fertility in most circumstances.

Education can be seen as providing the individual with four things: literacy, and the access to information and the broader perspective it makes possible; socialization or enculturation into different attitudes and behavior patterns; specific skills that often provide occupational advantages; and, often, a useful certification of status (Cochrane, 1979:29). Each of these things has some effect on fertility. Literacy leads to practical knowledge: contraception becomes more readily available, the survival of children more likely. Socialization leads to greater commitment to educate one's children. Occupational skills facilitate employment (and raise income), particularly in urban settings where jobs may interfere with childrearing. Certification may also facilitate employment, and in addition raise aspirations regarding a marriage partner. These effects on fertility are largely, though not exclusively, negative.

Educating women has a more negative effect on fertility than educating men (Cochrane, 1979, 1983; Strout, 1983). In comparisons of couples in 20 developing countries, lower fertility (with marital duration controlled) is almost always exhibited when the wife has secondary education than when the husband has secondary education (Rodriguez and Cleland, 1982). Summaries of household multivariate studies show that the effect of wife's education is negative more often, and more likely to be statistically significant, than the effect of husband's education (Cochrane, 1983). Explanations for this are not difficult to find, from the greater marriage delay due to female than male education to the stronger link between male education and household income, which may allow higher fertility.

Especially for female education, there is evidence that the negative effect does not appear until higher levels of education are reached. Some primary education, in fact, appears to increase rather than decrease fertility. Highest fertility is often found not among women without education, but among those with a few years, as few as three (in the Philippines) or as many as ten (in Sierra Leone) (Cochrane, 1983:607). This positive effect of education at low levels is especially marked in rural areas

(Hermalin and Mason, 1980) and in less urbanized and poorer developing countries, where per capita income is below US$500 (Cochrane, 1983:578). It generally does not appear in more advanced developing countries. A few years of education, under backward conditions, may lead to declines in breastfeeding or improvements in health care, which are not offset by such effects as marriage delay unless education continues.

Over time, the differential in fertility between education groups increase, at least at earlier stages of the fertility transition. Between 1960 and 1976, for instance, the average parity of women with secondary education in Egypt fell from 85 percent to 65 percent of the average for illiterate Egyptian women (Cochrane, 1983:610). Several factors therefore tend to produce a lag between rising levels of education and lower fertility: the normal gap between a woman's enrollment and her attaining the mean age of reproduction; the need to complete several years of primary school before a negative fertility effect can be observed; and this rising contribution of education to fertility reduction as fertility transition progresses.

An argument might be made that one other effect of education implies a shorter lag. Educating children reduces the economic contributions they make and increases their cost to parents. Not only does schooling prevent children from working on the farm or elsewhere, it also makes them less willing to do manual work and loosens their ties to their parents (Caldwell and others, 1981). For these reasons, the argument goes, children are a poor investment where education is important, and parents therefore should prefer smaller families.

Comparisons of developing countries in fact indicate that fertility transition seldom starts until roughly 75 percent of primary school age children are enrolled (note that these are gross, not net, enrollment ratios; Tan and Haines, 1984). However, there appears to be no relationship over time between primary enrollment and fertility; instead, fertility trends tend to be associated with secondary enrollment ratios. Since primary education is heavily subsidized and since younger children's labor contributions are often limited, this finding is not unexpected. It implies, however, that there are no shortcuts in reducing fertility through education. Apparently a sustained commitment over a period of time and the provision of more than minimal education are needed if fertility is to be reduced through this channel.

Health and Mortality: Biological and Behavioral Channels

Lower mortality facilitates the transition to lower fertility. At the individual level, the links between infant and child mortality and fertility are both biological and behavioral.

- At the biological level, lower infant mortality lengthens the interval between births, because an infant death abruptly terminates the protection against pregnancy provided by breastfeeding. A neonatal death shortens the birth interval by 3.2 to 6.0 months, and a postneonatal death by 1.7 to 3.8 months (Cochrane and Zachariah, 1983:6), and avoiding these deaths lengthens the interval correspondingly, if the woman breastfeeds.
- Higher child survival rates reduce the need for parents to "replace" children who have died. This replacement is typically partial rather than full: in Taiwan, for instance, an infant death leads couples to seek between 0.1 and 0.6 additional children (Heer and Wu, 1975, 1978). These numbers indicate desired replacement; those who actually succeed in replacing lost children may be fewer.

- As the likelihood of infant and child survival improves in a community, the parental motivation to "hoard" extra children as a guarantee against possible deaths diminishes. Hoarding has been shown to be a response to low perceived survival levels in Taiwan, China (Heer and Wu, 1975, 1978) and Egypt (Rizk and others, 1980; but see Pebley and others, 1979, for negative results for Guatemala). The decline of hoarding in settings where mortality has fallen steeply may be inferred from the greater tendency of women in such settings to make up the loss of a child, which is not necessary if one insures against the loss in advance (Schultz, 1978; Ben-Porath, 1976; Schmitz, 1983).

- Better survival chances alter the way parents relate to their children, increasing their emotional investment in each one and their concern with "child quality" and reducing the cost of producing children, thereby increasing the propensity to favor smaller families.

The biological and the replacement effects combined imply that a fall in mortality of one child per family will lead to a fall in fertility ranging from 0.1 births (in Sri Lanka) to 0.8 births (in Syria), and averaging 0.5 births across 25 developing countries (Cochrane and Zachariah, 1983:iii; cf. Trussell and Olson, 1983). The effects of reduced hoarding and greater investment in children have not been quantified, though one Colombian study suggests that hoarding has at least twice the effect of replacement on fertility (Olsen, 1980).

A reduction in infant and child mortality will not be completely offset, at least in the short run, by fertility reduction. Nevertheless, lower mortality is essential to fertility transition. In contrast to the widely varying mortality levels at the start of fertility transition in European countries (Knodel and van de Walle, 1979), life expectancy was at 53 years or above at the start of fertility transition in almost every developing country where this process has started (Bulatao and Elwan, 1984). For most countries of sub-Saharan Africa and South Asia, where life expectancy has not reached this level, lower mortality is therefore virtually a requirement.

Three important synergistic linkages also exist between programs to reduce infant and child deaths and programs to reduce fertility. First, an adequate public health system is of great value to a fertility control program. The public health system might itself be used to deliver contraceptives, or can provide the desirable medical backup, and more basically demonstrates government concern and administrative capacity for dealing with human problems in the countryside. Second, birth spacing and breastfeeding are themselves highly desirable public health measures that have significant impact on infant and child mortality rates, in addition to their effects on fertility. Third, improvements in household status often lead simultaneously to better infant and child survival and lower fertility. Maternal education, in particular, leads not only to later childbearing and smaller families but also to improvements in children's health, especially in areas of high mortality (Cochrane and others, 1980). A more educated woman is likely to feed her children better, though she may unfortunately breastfeed less; to pay more attention to hygiene; and to believe more strongly in modern medicine and have better knowledge of and access to medical facilities. Thus reducing mortality and reducing fertility are interlinked activities that can be pursued jointly.

Employment: Uncertain Effects

Many dimensions of employment are potentially of interest in regard to fertility; none of them is easy to study. Employment depends on education, is bound up with place of residence, and results in a greater or smaller increase in income. Each of these factors has its own complex effects on fertility, and the specific effects of employment are consequently difficult to untangle.

Comparisons between countries have focused on the proportion of the labor force in agriculture, with the argument that traditional links between family and work are disrupted and the economic returns from children diminish as the labor force shifts into industry. A few studies suggest that the decline in the agricultural labor force contributes to fertility decline (Birdsall, 1977:80-81), but the time-series evidence is not strong (Richards, 1983:721-722).

At the household level, the fertility differential between agricultural and nonagricultural workers varies greatly, depending on a number of factors like stage of development. Farmer fertility is often high, though not necessarily highest among all occupation groups. As fertility declines, farmer fertility sometimes falls faster than fertility in other groups (United Nations, 1973:100-101; see also McGreevey and Birdsall, 1974:18-19). In some developed countries, a U-shaped relation between occupational status and fertility has emerged, with the highest fertility not only among low-status groups like farmers and farm workers but also among high-status groups (Andorka, 1978:251-258).

The employment of women has attracted special attention, because of the possibility that work could interfere with childrearing and provide reasons for favoring a smaller family. This is not easy to test; it is quite possible that female employment initially requires having a smaller family rather than eventually leading to fertility control. Numerous studies have attempted to verify the hypothesis that working women in developing countries have lower fertility, with notable lack of success (Standing, 1983; Brazzell, 1983). To women in developed countries, it may appear that employment leaves little time for childcare, but this is seldom true for peasant women in developing countries (Standing, 1983). Family agriculture and cottage industries keep women close to the home and permit considerable flexibility in working conditions, and are therefore often compatible with childcare. Such jobs do little to modernize a woman's outlook or to develop a commitment to continued employment that may interfere with fertility. In addition, peasant settings often provide parental surrogates from within the extended family or other cheap sources of domestic care. Childcare requirements are typically low, and personal tutelage by the parents seldom emphasized. Finally, in low-income areas, any remaining incompatibility between childcare and work is often resolved by a woman's reducing her leisure time rather than her work time (see studies cited in Standing, 1983:525).

These means of resolving the conflict between childcare and work tend to be less available in urban areas. Though there are many exceptions, research in these areas more often finds that women working full-time tend to have fewer children (Brazzell, 1983:65). Women employed in the modern sector, especially, tend to have lower fertility, despite the pronatal implications of the higher incomes and maternity benefits they receive. Even in these cases, however, it has proven very difficult to confirm that employment itself has been responsible for reducing fertility.

Where an inverse relation does exist between urban, modern-sector female employment and fertility, contraceptive use apparently accounts for only a part of it (Brazzell, 1983:56-59). Of equal significance is the delay in marriage that results from female employment (Duza and Baldwin, 1977). Even if late-marrying women eventually end up with the same number of children as other women (which is generally not the case), the delay in the start of childbearing reduces fertility rates immediately.

At least as important for fertility as female employment is child employment. The earnings of children under 15 tend to be small but not insignificant. From a child between 7 and 14, a couple might expect to receive the equivalent of 5 to 10 percent of household income (Rivera-Batiz, 1983:80). It is not easy to quantify all a young child's contributions, however. Some of them may involve work adults tend to avoid, and in this sense children may be difficult to replace (Caldwell, 1983). Older children contribute about as much as adults. At age 16, a male child's earnings approximate those of the male parent in some areas (Rivera-Batiz, 1983:80). Overall, therefore, a child's earnings may be economically significant to a poor household. Whether these typically outweigh the child's costis not certain. Nevertheless, these earnings exceed the contributions to their families expected from children in developed countries, and provide an important additional reason for peasant parents to want many children.

During the 18th and early 19th centuries, declines in child labor force participation rates in England tended to coincide with fertility declines; a similar parallelism appeared in the United States. This evidence is illustrative but not conclusive. Among other things, the fall in child workers might be attributed largely to the fall in the proportion of children in the population (Repetto, 1976). Across developing countries, parental expectations about children's economic contributions (including contributions after parents retire) are strongly related to fertility levels (Bulatao, 1979, 1982). Over half of surveyed couples mentioned children's economic contributions as an important advantage of having children in such countries as the Philippines, Indonesia, and Thailand, in contrast to under 20 percent in more advanced countries like South Korea and Singapore.

Using various proxies for child employment, a number of studies have found a significant positive relationship between child employment and fertility at the household level (Schultz, 1969, 1970; Nerlove and Schultz, 1970; Maurer and others, 1972; DaVanzo, 1972). The relationship is not absolute, however. The effect of child wage rates is somewhat uncertain, and may depend on the landholding status of the household. Nor is is clear whether legislation limiting child labor would have much effect on fertility. Most such laws do not cover the majority of working children. If they did, enforcement would be very difficult, and could severely impair the ability of poorer households to support themselves. Compulsory education laws, similarly, must often be modified in practice to permit children to work on the farm when needed.

Attempts to reduce fertility solely by changing employment patterns, therefore, are likely to have limited success. Increasing female employment in agriculture or cottage industries has uncertain effects on fertility, though placing women in modern-sector jobs--a considerably more expensive proposition--does lead to the desired fertility reduction. Reducing child employment is potentially an important step, and is a key factor in the fertility transition. This is difficult to accomplish, however, other than through the normal development process.

Urban-Rural Residence: Pervasive Influence

Among the development factors considered here, residence has an unusual position. Governments almost never favor increased urban growth, because of the problems of dealing with burgeoning urban populations. Nevertheless, residence summarizes many fertility-relevant differences in opportunities available to households: urbanites generally have access to better education, a wider spectrum of work opportunities, a more sanguine public health environment, and generally more avenues for self-improvement and social mobility. They also face higher costs in raising children. With all these differences taken into account, urban fertility tends to be substantially lower than rural fertility, by 0.5 to 1.5 births on average across countries (Stolnitz, 1983).

Is there any "pure" urban effect, apart from the superior opportunities and public facilities--and higher costs--in urban areas? One impact of urban living is the wider and more varied, though possibly less intimate, personal contacts it promotes and the access to communication networks it makes possible (Findley and Orr, 1978; Goldberg, 1976). Such contacts can lead to a wider search for a marriage mate and a consequent delay in marriage, to the readier legitimation and spread of the idea of controlling fertility, and to the quicker diffusion of contraceptive technology. Another aspect of urban living, and of the communication networks generally rooted in urban areas, is the continual introduction and diffusion of new goods, from bicycles and TV sets to electronic games and the latest fads and fashions. Aspirations for such goods eventually conflict with childrearing goals: in Taiwan, China and Indonesia, households owning a greater number of modern consumer durables have been shown to have lower fertility (Freedman, 1976; Chernichovsky and Meesook, 1981:45, 57; Lee and Bulatao, 1983).

On the other hand, many urban-rural differentials are not inherent, and can be increased or decreased by appropriate policy. When differences between urban and rural households in education, income, and other fertility determinants are discounted, the fertility differential between urban and rural households is substantially reduced (United Nations, 1979). The total effect of residence, including its pervasive influence on other fertility determinants, tends to be significant, but the pure effect, with all other determinants controlled, tends to be small.

In fact, cases are occasionally reported of lower rural than urban fertility, as in particular surveys in Indonesia, Egypt, and Nigeria (Birdsall, 1980). Careful comparisons (of total fertility rates estimated from cumulative fertility) suggest, to the contrary, that urban fertility is lower in each of 20 countries covered by the World Fertility Survey, when all urban and all rural women are compared. When only ever-married women are compared, urban women still have lower fertility, except in three countries: Indonesia, Pakistan, and Bangladesh (Rodriguez and Cleland, 1980). In these countries, and in several others, the later age at marriage in urban areas reduces urbanite fertility (Cochrane, 1983).

The effect of urban residence on fertility tends to increase with a society's level of urbanization (Findley and Orr, 1978; Cochrane,1983; Stolnitz, 1983). In more urbanized societies, urbanites are more likely to come from larger and more cosmopolitan centers, where antinatal influences are likely to be even stronger. As already noted, a higher level of urbanization also appears to accentuate the influence of other development indicators, such as education, on fertility (Gregory and Campbell, 1976). The prospects for further urbanization leading to lower fertility appear best, therefore, in more urbanized Latin American countries, and appear poor for sub-Saharan Africa.

Women's Status: A Key Factor?

Employment aside, improvements in the welfare of women are particularly likely to contribute to fertility decline. Where education reduces fertility, female education has a much larger effect than male education. Women whose social and economic opportunities improve generally become more sensitive to the costs of bearing and rearing children. Carrying a disproportionate share of the burden for childrearing, women are more likely to feel restricted by children once alternative opportunities are available (Oppong, 1983). Women's status in the home also makes a difference; more frequent communication between spouses, for instance, is linked to lower fertility (though for greater female decision power the evidence is ambiguous; Beckman, 1983). Although a surprising number of women use contraception without the knowledge of their husbands (Brody and others, 1974; Shedlin and Hollerbach, 1981), couple communication generally leads to longer and more effective contraceptive use (e.g., ESCAP, 1974; Kar and Talbot, 1980; Beckman, 1983).

Low status for women also induces a preference for sons over daughters, which sometimes contributes to higher fertility. Son preferences have been shown to induce women to want additional children in several countries (Bulatao and Fawcett, 1983) and to reduce contraceptive use in the Republic of Korea and in Taiwan, China (Freedman and Coombs, 1974; Kim and Choi, 1981; Arnold, 1982; Park, 1983). Son preferences in other areas, like South Asia and many Muslim countries, may also have fertility effect, though this is difficult to verify because of low levels of contraceptive prevalence (see also McClelland, 1983). It should be noted, however, that a stronger influence on the desire for children--even in some countries with strong son preference--is the preference for a balance between sons and daughters, or for some children of each sex (Pullum, 1983; Bulatao and Fawcett, 1983).

The possible contribution of low female status to high fertility may be illustrated for north India, where women enjoy less autonomy than in south India (Dyson and Moore, 1983). A north Indian woman is separated from her family at marriage and required to develop new allegiances to her husband's kin group. This patrilineal group is a basic unit of social organization, and it carefully protects itself against a woman straying--her personal contacts and relations with strangers are rigidly controlled--or subverting it through becoming too close to and influencing her husband. Women are appendages in these groups; they neither inherit property nor pass it on. Early arranged marriages are preferred, because an unmarried woman is a liability to her family and because it is easier to incorporate a young and insecure bride into a patrilineal group. Within the group, her main role is to provide male heirs, and only by doing this can she make a positive impression. It is easy to see that this system would ordinarily favor high fertility, and would prevent women from responding positively to a family planning program. Some improvement in status in settings like this could well have important antinatal effect; nevertheless, low female status does not seem to be a bar to fertility transition, nor is high status a guarantee of it (Dyson and Moore, 1983:57-61, footnotes 41, 60, 78).

Summary and Implications

This discussion of the tangled web connecting specific development indicators to fertility decline should not obscure the central fact that socioeconomic development does, in the long run, contribute greatly to lower fertility. Much of the ambiguity concerning the effects of specific indicators arises from the intricate linkages among them. Composite indices reflecting development or modernization, by contrast, almost always show a substantial effect on fertility (Adelman and Morris, 1966; Cutright and others, 1976; Cutright and Kelly, 1978). This is an obstacle to analysis, but in some ways a boon to policy, because successful introduction of improvements in education, health, and other areas should have ramified consequences, generally contributing, through many different channels, to lower fertility.

Nevertheless, as the preceding discussion demonstrates, trusting entirely to development to bring lower fertility is insufficient. For one thing, substantial improvements in welfare are generally necessary for fertility reduction; minor improvements often raise fertility instead. Small improvements in infant and child mortality merely mean more mouths to be fed. A couple of years of primary education mean slightly larger families. Employment of women in cottage industries or other low-paying part-time jobs has little effect on fertility, or, like a transitory increase in income, may instead permit the household to support additional children. Residence in small urban areas does less to reduce fertility than residence in more urbanized communities. In each case, welfare improvements beyond elementary levels do contribute to fertility decline, and minor improvements, if sustained over a period of years, have an eventual payoff, but one that may be considerably delayed.

Furthermore, certain improvements in welfare contribute relatively little to fertility reduction if other conditions are not appropriate. In particular, reductions in infant and child mortality contribute to lower fertility only where there are no serious obstacles to using birth control (Heer, 1983). Similarly, it has been argued that the contribution to fertility decline of female employment in the modern sector should be greater where contraception and abortion are more readily available (though there is little hard evidence on this point; Rivera-Batiz, 1983:68-69). Easy availability of fertility regulation methods may be less critical in permitting improvements in female education to reduce fertility, because education itself improves a woman's access to such methods. Nevertheless, the effect of education is not autonomous; it appears to be greater at higher levels of urbanization (Cochrane, 1983), which may be linked to the greater commercial availability of regulation methods.

Improvements in the welfare of women are particularly likely to contribute to fertility decline. Where education reduces fertility, female education has a much larger effect than male education, and female employment in the modern sector contributes significantly to marriage delay and marital fertility control. Other improvements in women's status--increasing the communication between spouses, for instance--should also contribute to reducing fertility.

Some improvements in the welfare of children, particularly reduced mortality and morbidity, also appear to be useful instruments for promoting fertility decline. Other measures to enhance child welfare have somewhat problematic effects. Increasing enrollment levels and reducing child employment should favor smaller families, but in the process also penalize large families that depend on children for an important part of their income. Nor is it easy to achieve such changes through legislation, given the cost and other difficulties of enforcing compulsory schooling and minimum working age laws.

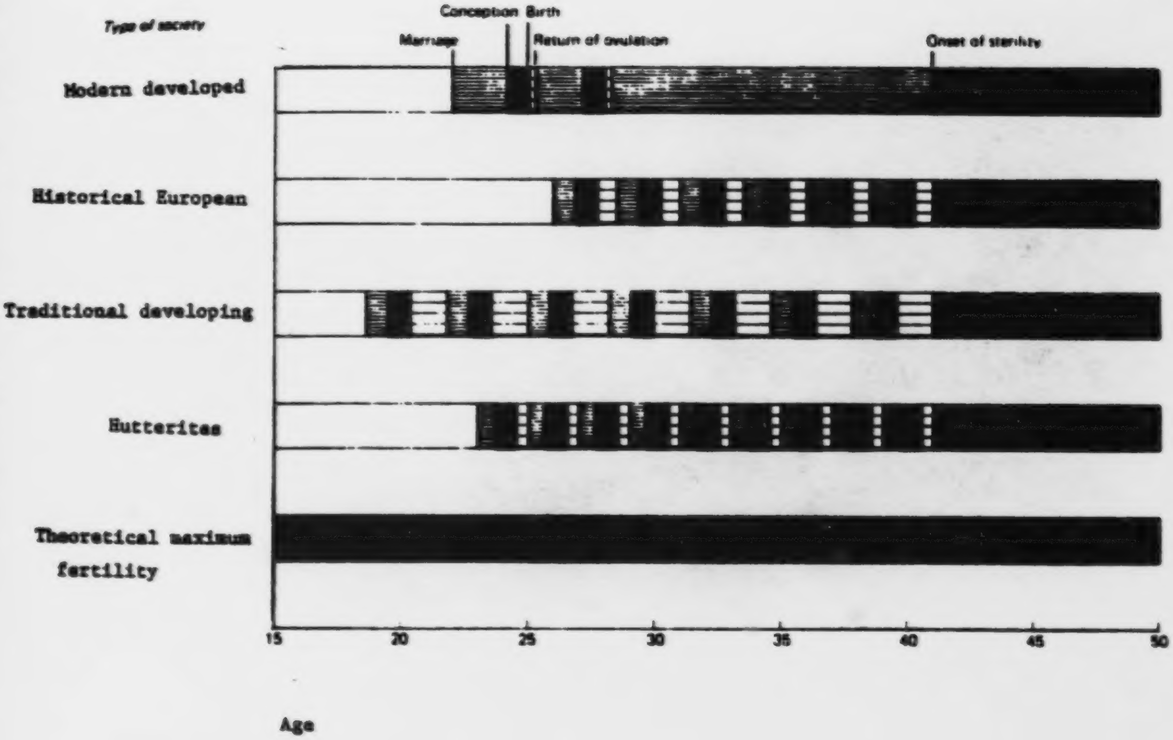
Integrating all these effects on fertility requires a closer look at fertility dynamics at the individual or household level. A couple's fertility is the result of a series of decisions and actions, biological characteristics and social opportunities, that affect childbearing at different points in the reproductive span. Changes in the couple's status have a multiplicity of effects on fertility best understood from the perspective of the specific behaviors--principally marriage timing, breastfeeding duration, and the practice of contraception and abortion--that give rise to fertility outcomes.

FERTILITY BEHAVIOR AND FERTILITY TRENDS

Women's childbearing span is segmented in Figure 2, illustrating the portions of the span affected by marriage, breastfeeding, and fertility regulation in different settings. Marriage affects fertility as the main social mechanism regulating exposure to the risk of conception. The timing of initial exposure is critical; at the other end of the reproductive span, the termination of exposure, whether through menopause, terminal abstinence, divorce, or death, produces much less variation in fertility. Breastfeeding affects fertility through prolonging the postpartum infecundable period, during which conception is biologically impossible. Other factors that affect the interval between births, such as sterility and intrauterine mortality, generally have much smaller demographic effect.

Traditional developing societies achieve high fertility by early marriage and short waiting times to conception, related to limited use of contraception and abortion. Fertility would be even higher except for lengthy postpartum infecundable periods produced by breastfeeding, complemented in some instances by long postpartum abstinence. Modern developed societies, by contrast, achieve low fertility, despite short postpartum infecundable periods, by later marriage and long waiting times, produced by much use of contraception and abortion.

Figure 2 Average timing of reproductive events in selected types of societies



Source: Bongaarts and Potter (1983:6)

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Effects of Behavior on Fertility Levels

Data for 29 developing countries covered by the World Fertility Survey, mostly falling between the extremes illustrated in Figure 2, allow comparisons of the effects on fertility of marriage, breastfeeding, and contraception (induced abortion was not covered). Table 1 shows calculations of the percentage reduction from theoretical maximum fecundity (assumed here to be 17 births for each country, though individuals could have more) due to each of these behaviors, as well as to all other unmeasured factors combined Bongaarts and Potter, 1983; cf. Hobcraft and Little, 1984). The unmeasured factors will be largely ignored in this discussion; their size depends largely on the arbitrarily chosen maximum fecundity level.

The five African countries covered (Ghana, Kenya, Lesotho, Senegal, and North Sudan) are largely similar: total fertility is high, from 5.2 to 7.4, with postpartum infecundability due to breastfeeding (postpartum abstinence was not measured) accounting for the major part of foregone fertility, while delayed marriage contributes little and contraception hardly anything. The three mainland South Asian countries covered (Bangladesh, Pakistan, and Nepal) show a similar pattern, even more extreme in the case of Bangladesh, which has the longest mean breastfeeding duration reported in the World Fertility Survey (27 months for breastfed children) and the youngest average mean age at marriage for women (16 years).

Two Middle Eastern countries, Jordan and Syria, have even higher total fertility rates than these African and mainland South Asian countries. These high rates, 7.6 and 7.5 respectively, are produced by a combination of shorter breastfeeding, a roughly comparable marriage age to Africa and South

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Two Middle Eastern countries, Jordan and Syria, have even higher total fertility rates than these African and mainland South Asian countries. These high rates, 7.6 and 7.5 respectively, are produced by a combination of shorter breastfeeding, a roughly comparable marriage age to Africa and South Asia, and limited fertility reduction due to contraception, insufficient to offset shorter and less frequent breastfeeding.

Of the remaining Asian countries, Sri Lanka, Indonesia, and Thailand show reductions in fertility due to breastfeeding close to those for the African and mainland South Asian countries. All the rest of the Asian and Pacific countries (Republic of Korea, Malaysia, the Philippines, and Fiji) as well as all the Latin American and Caribbean countries have markedly less fertility reduction due to breastfeeding.

Somewhat later marriage may approximately compensate for lower levels of breastfeeding. Considerable variation exists in marriage timing between countries, however, even within regions. Marriage delay has the greatest fertility effect in Sri Lanka and Costa Rica, where the marriage effect is comparable to that for developed countries, and the least effect (outside the

Table 1 Total fertility rates and percentage reduction from total potential fecundity due to different determinants of fertility

Country	Total fertility rate	Percentage of reduction from total fecundity due to			
		Marriage	Breast-feeding	Contra-ception	All other factors
Sub-Saharan Africa					
Ghana	6.22	20	40	8	32
Kenya	7.40	28	44	7	21
Lesotho	5.27	26	37	4	33
Senegal	6.90	17	46	2	35
Sudan (North)	5.93	26	35	4	36
Middle East and North Africa					
Jordan	7.63	35	27	28	10
Syria	7.46	36	29	22	13
South Asia					
Bangladesh	5.96	11	62	7	21
Nepal	6.12	16	56	2	26
Pakistan	6.24	21	42	4	33
Sri Lanka	3.70	38	32	17	13
East and Southeast Asia and Pacific					
Fiji	4.14	27	13	28	33
Indonesia	4.51	21	42	20	17
Korea, Rep. of	4.23	37	26	20	17
Malaysia	4.62	35	8	24	33
Philippines	5.12	42	22	25	11
Thailand	4.55	32	31	28	9

Table 1 (continued)

Country	Total fertility rate	Percentage of reduction from total fecundity due to			
		Marriage	Breast-feeding	Contra-ception	All other factors
Latin America and Caribbean					
Colombia	4.27	37	12	33	18
Costa Rica	3.17	34	6	50	11
Dominican Rep.	5.39	32	14	31	22
Guyana	4.78	24	9	26	41
Haiti	5.15	37	27	12	24
Jamaica	4.67	21	13	34	32
Mexico	6.27	32	17	32	19
Panama	3.84	32	11	51	9
Paraguay	4.56	36	16	26	22
Peru	5.35	40	23	24	13
Trinidad & Tobago	3.18	21	7	34	38
Venezuela	4.36	33	11	40	16

Source: Calculated from Casterline and others (1983). Total fecundity of 17 is assumed, in order to assure a nonnegative Bongaarts-type index for "all other factors." The natural logs of the indices were taken, and converted to percentages of their total.

African, mainland South Asian, and Middle Eastern countries) in Jamaica and Indonesia.

The contribution of contraception varies the most across countries. A large contribution of contraception almost always accompanies low total fertility. The fertility reduction due to contraception is largest, though still not as large as in developed countries, in Costa Rica, Panama, and Trinidad and Tobago, where the total fertility rates are 3.2, 3.8, and 3.2 respectively. In these three countries, three other American countries (Guyana, Jamaica, and Venezuela), and Fiji contraception has achieved a greater fertility-reducing effect than marriage delay. Reductions due to contraception are, somewhat surprisingly, smaller in some Asian countries with established family planning programs, like South Korea and Malaysia, than in the American countries generally. Somewhat earlier surveys may be partly responsible, and part of the explanation for Korea may be frequent resort to abortion.

Changes in Behavior During Fertility Transition

These comparisons indicate the pronatal impact of breastfeeding changes in fertility transition, the counterbalancing effect of marriage changes, and the eventual dominance of contraception (with, typically, some assistance from abortion) in producing low fertility levels. Examining trends for a few countries with available data reinforces this characterization. In India, in the six years between 1972 and 1978, the total fertility rate fell by half a child, from 5.7 to 5.2 (Jain and Adlakha, 1982:599). In Indonesia, the change between 1970 and 1980 was slightly greater, at almost one child, from a total fertility rate of 5.5 to a rate of 4.6 (McNicoll and Singarimbun, 1983:75). The declines in the total fertility rate were more than twice this in Korea from 1960 to 1970 (from 6.1 to 4.0) and in Thailand from 1968 to 1978 (from 6.1 to 3.4) (Bongaarts and Potter, 1983:109; Knodel and others, 1982:127).

The contribution of each fertility behavior in each country cannot be precisely pinned down, because changes were simultaneous and their influences overlap. Partitioning these overlaps roughly in proportion to the "pure" contribution of each determinant permits some estimates of relative contribution, presented in Table 2.

Note first the last column of the table. This residual column indicates that the contribution of all other unmeasured factors in these fertility declines was generally small, not exceeding 4 percent across the entire period for any country, though it appeared larger in some subperiods. In principle these unmeasured factors could have had large but offsetting effects, but this is unlikely. The four factors represented here appear to be the major factors implicated in fertility decline.

- Among these factors, reductions in breastfeeding retarded fertility decline in each country, having 15 to 45 percent of the effect of all the other factors combined, but in the reverse direction. Breastfeeding changes led to increases in total fertility ranging from 0.3 in India to 0.8 in Korea.
- Marriage delay, on the other hand, contributed in every case to fertility decline, roughly offsetting the effect of breastfeeding. The reductions in total fertility ranged from 0.2 in India to 1.1 in Korea.
- The major factor in fertility decline in every case, however, was an increase in contraceptive use. Except in Korea, the spread of contraception would have accounted for almost as much fertility decline as actually observed, or even more decline, if the other factors had stayed

Table 2 Percentage contributions of proximate determinants to decline in total fertility rate

Country and period	Reduction in total fertility rate	Percentage contribution to reduction due to				
		Marriage	Breast-feeding	Contra-ception	Induced abortion	All other factors
India						
1972-78	0.51	41	-58	114	--	3
Indonesia						
1970-75	0.40	38	-95	165	--	-9
1975-80	0.50	44	-65	111	--	10
1970-80	0.90	41	-77	134	--	2
Korea, Rep.of						
1960-70	2.16	50	-38	53	30	4
Thailand						
1968-71	0.82	0	0	96	14	-11
1971-74	0.78	19	-8	91	20	-22
1974-78	1.14	11	-31	78	15	26
1968-78	2.74	11	-17	86	16	4
Synthetic transition						
Pre to early decline	2.00	65	-55	87	0	3
Early to late decline	1.15	50	8	31	15	-4
Late to postdecline	1.82	0	-31	117	13	2
Pre to postdecline	4.97	28	-29	90	10	1

Note: Following Casterline and others (1983), the contribution of each factor is calculated as the difference in the logs for the Bongaarts indices for that factor for the two dates divided by the difference in the logs of the earlier and the later total fertility rates, multiplied by 100.

Sources for the Bongaarts indices: India, Jain and Adlakha (1982:599); Indonesia, McNicoll and Singarimbun (1983:75); Republic of Korea, Bongaarts and Potter (1983:109); Thailand, Knodel and others (1982:127); synthetic transition, Bongaarts (1982).

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constant. The total fertility declines due to contraception ranged from 0.6 in India to 2.4 in Thailand.

- The effect of induced abortion, finally, can be observed only in Thailand and Korea. In Thailand, abortion contributed about a fourth of what contraception contributed to decline; in Korea, abortion contributed more than half of what contraception contributed.

A convenient summary of the contribution of behavior changes to fertility decline, covering a greater range in fertility than these individual examples, can be provided by cross-sectional comparisons of countries at different fertility levels (Bongaarts, 1982). The predecline phase may be represented by countries with total fertility rates above 6.0, early decline by countries with total fertility rates between 4.5 and 6.0, late decline by countries with rates between 3.0 and 4.5, and postdecline by countries with rates below 3.0. In developing countries which have recently shown fairly rapid fertility declines, the movement from a total fertility rate of 6.0 to a total fertility rate of 4.5, and from 4.5 to 3, require roughly seven years each (from the time fertility decline actually starts); in countries where decline has been slower, as many as 25 years for each segment are required (Bulatao and Elwan, 1984).

Between predecline and postdecline countries, the difference in total fertility is almost 5 children (Table 2). Increasing delay in marriage contributes about 1.4 of this difference; wider contraceptive use contributes 4.5; increased abortion contributes 0.5; reduced breastfeeding works in the opposite direction, raising total fertility by about 1.5; and other unmeasured factors have a negligible effect. Marriage delay and breastfeeding reductions have their greatest effects in the early stages of fertility decline; contraception and abortion are more important later.

The main implications of these patterns deserve emphasis. First, a substantial increase in fertility regulation, including contraception and induced abortion, is indispensable to completing the fertility transition. No transition has ever been accomplished without substantial control of fertility within marriage. Second, it is unwise to ignore either marriage timing or breastfeeding practices in attempts at fertility reduction. These two sets of behaviors have large effects, which can complement or retard efforts at promoting fertility regulation. Third, the potential for development producing marriage and breastfeeding changes with substantial impact on fertility is greatest in sub-Saharan Africa and South Asia. Long breastfeeding durations are threatened by development, while low marriage ages provide an opportune target for antinatal changes. Fourth, in other regions, contraception and abortion are the main though not exclusive concerns. If some way could be found to increase breastfeeding practice or lengthen its duration, this would assist in fertility reduction, but not replace the need for greater contraceptive practice.

The pattern of changes in fertility behaviors also suggests some explanations for long-run versus short-run effects of development on fertility. The long-run effect of development is tied to the spread of fertility regulation. However, the diffusion of contraception and abortion may lag behind changes in other behaviors, and short-trun effects of development can therefore be different. In particular, if a country starts from a low development level, breastfeeding changes are likely which may actually increase fertility. Reductions in sterility, which have not been discussed so far, may also contribute to fertility increase in some areas. Rising fertility in the course of modernization has occasionally been observed. In Kenya, for instance, total fertility is estimated by one analyst to have gone from 6.8 in 1962 to 7.6 in 1969 to 8.0 in 1973 (Henin, 1979). This is not an isolated example. Eleven Latin American or Caribbean countries and six African or Asian countries all had higher crude birth rates at their peak (20 to 45 percent higher, where estimates could be made), before fertility decline, than in earlier periods (Nag, 1980). The threat that fertility will rise is particularly acute for sub-Saharan Africa, where not only long breastfeeding durations but also frequent postpartum abstinence and high levels of sterility in some areas are likely to change in the near future.

Although development has long-run antinatal effect, therefore, its effect in any specific setting depends on how particular fertility behaviors are affected. These behaviors, their links to development, and the options for affecting them will now be examined.

RAISING AGE AT MARRIAGE

Women who marry early tend to have more children than women who marry late for several reasons. They begin childbearing at an earlier age and are exposed to the risk of conception for a longer period, often including their most fecund years. They often forfeit the possibilities of longer schooling and early employment, and enter marriage with less of the motivation and fewer of the personal resources necessary to plan their families successfully. In addition, early marriage means a shorter gap between successive generations, significantly increasing the birth rate.

Patterns and Trends

Marriage before the age of 20 is most prevalent in South Asia and sub-Saharan Africa, where over half of all women between 15 and 19 are or have been married. The proportion married in this age group is only 17 percent in Latin America and the Caribbean, by contrast, and only 2 percent in East Asia (Henry and Piotrow, 1979:106). Variations among the countries in each region are considerable. In most countries of the Middle East and North Africa, roughly 25 to 50 percent of women 15 to 19 have ever been married. Falling well outside this range, however, are the neighboring countries of Tunisia, at 6 percent, and Libya, at over 70 percent. Within South Asia, singulate mean age at marriage for women is 16 in Bangladesh, relatively typical for the region, but over 25 in Sri Lanka (D. Smith, 1980:3). If Bangladesh could immediately adopt the Sri Lankan marriage pattern, with no other change in fertility practices, its total fertility would fall by 2.2 children.

Marriage involves, of course, a great variety of culturally specific practices. One that might be assumed to affect fertility is polygyny, the practice of a man having two or more wives. In West Africa as a whole, an average of 20 percent of married males are reported to be in polygynous unions (Chojnaka, 1980). The fertility effect of polygyny is mixed, however. There is no conclusive evidence that it either raises or lowers a woman's fertility (Burch, 1983). Whereas legal marriage may be the rule in many countries, consensual unions--socially recognized but with no legal standing--are more common in some places. One estimate for Jamaica is that 60 percent of unions are of this type (Denton, 1979). Even less formal than consensual unions are visiting unions, in which the partners live together intermittently. Consensual and visiting unions are typically transitional stages preceding legal marriage, and women in such unions tend to have fewer children (Burch, 1983). Parentally arranged child marriages, still important for parts of South Asia, contribute to higher fertility, but their impact is not as great as it might be because consummation is often delayed and because of lower fecundity at very young ages.

With changes in these cultural patterns and in the economic situation facing prospective marriage partners, age at marriage tends to change. Patterns have been changing most, among developing regions in the recent past, in Asia. A rise in the singulate mean age at marriage of one to two years over a five-year period is common in these countries, as opposed to only half that rise in Latin America (D. Smith, 1980:3). The Republic of Korea provides a striking example of this change. In the fifty years from 1925 to 1975, female mean marriage age rose substantially from 16.6 to 23.7. This rise started slowly and gradually picked up speed, especially in the years between 1955 and 1966, when mean marriage age was rising at a rate exceeding 0.2 per year. Since then the rise has slowed (Cho and others, 1982:84). Earlier it was suggested that the greatest effect of rising marriage age would come early in the fertility transition. This seems to have been the case in Korea. Similarly large increases in age at marriage might also be shown for other countries, like Sri Lanka and the Philippines; in these countries, however, age at marriage was already relatively high early in the century (P. Smith, 1983).

The virtually universal trend toward later marriage in developing countries (P. Smith, 1983) contrasts with the experience of Western Europe. Hajnal (1965) has argued that a pattern of late marriage developed in the 17th century in Western Europe, connected with the idea that a married couple should have the resources to set up an independent household. By the 19th century, nearly 70 percent of Western European women stayed single through their early twenties, and about 15 percent never married. As contraceptive information and products spread in the late 19th century, marriage rates stayed essentially stable or even increased. Thus fertility transition in Europe started with marriage already quite late, and was accomplished with no assist from marriage changes or even despite some increase in fertility due to earlier marriage. The experience of developing countries today is in sharp contrast: changes in marriage timing instead contribute substantially to fertility transition.

The reasons for increased marriage delay are multiple and often tied to specific historical events or cultural patterns. In Korea, for instance, the tradition of early marriage was substantially undermined by considerable migration into and out of the country as well as from rural to urban areas and by the social unrest connected with World War II, liberation, the partitioning of Korea, and the Korean War. Increasing educational opportunities for both men and women and compulsory military conscription have also played a part. Manufacturing has increasingly provided jobs for women, in a society in which such work has been considered incompatible with marriage but quite compatible with continuing to live at home and contributing to the support of one's parents (Cho and others, 1982:84-88; Henry and Piotrow, 1979:120). Several of these factors operate similarly in other countries.

Determinants of Marriage Timing

One demographic factor controlling marriage timing is the availability of appropriate partners. Besides wars, sex-specific migration and changes in mortality rates can distort sex ratios sufficiently to make a longer search for a mate necessary. The substantial sex ratio distortions due to the migrations of Chinese throughout Southeast Asia, and more recently of male Pakistani, Filipino, and other workers to the Middle East, have the tendency to produce marriage delay. When the preferred age gap between spouses is large, the effect of sex ratio distortions may be even greater (P. Smith, 1983).

One socioeconomic factor with a reliable, and typically large, effect on marriage timing is female education. The average woman with seven or more years of education marries at least 3.5 years later than the average woman with no education in 10 out of 14 developing countries (McCarthy, 1982:18-19). The contribution of female education to marriage delay is confirmed in multivariate studies in Korea (Lee and McElwain, 1981) and Malaysia, (Anderson, 1981) and appears to become stronger over time in studies of Taiwan, China (Casterline, 1980), Colombia, and Sri Lanka (Trussell and Bloom, 1981).

There are several competing explanations for the effect of female education. Since it increases a woman's earnings, education may delay marriage in settings where marriage requires a woman to quit work (Smith, 1983). Alternatively, education may raise a woman's standards for a mate, requiring a longer search (Keeley, 1977). Taking a traditional view of marriage as a complementary relationship in which a male specializes in market production and a female in home production, Becker (1981) has suggested that more female education would reduce the benefits of this division of labor, thereby delaying marriage as well as reducing its prevalence. Higher male education should increase the benefits of the household division of labor, as well as making more resources available for marriage, and should therefore have the opposite effect on marriage timing. Some support for this view comes from finding a negative effect on the marriage rate of the ratio of female to male education in Thailand (Maurer, and others, 1973) and from relatively weak findings for Malaysia of a negative effect on marriage age of wealth and husband's wage, whereas the effect of wife's education was positive (Anderson, 1981). These explanations assume that marriage follows leaving school. The two events may be linked, however. The relationship between them could arise, therefore, simply because marriage and school attendance are competing uses of a woman's time, as may be indicated by the greater effect of higher education than of education at lower levels on age at marriage (Cochrane, 1979).

Also consistently related to later marriage, possibly for many of the same reasons, is female employment in the modern sector (e.g., Lee and McElwain, 1981; Maurer, and others, 1973). The net effect of premarital nonfarm employment in five Asian countries has been estimated as a marriage delay of 1.5 to 2 years (Hirschman, 1982). A delay appears even for consensual unions: a Jamaican study confirmed that women who experience no prolonged unemployment on leaving school entered consensual unions later than other women (Standing, 1981). Agricultural employment does not have the same effect (Henry and Piotrow, 1979; Rotella, 1983).

Urban as opposed to rural residence also has a consistent effect, somewhat smaller than that of female education, in delaying marriage. The average urban woman marries at least 1.5 years later than the average rural woman in 10 out of 14 developing countries (McCarthy, 1982:10-11). These urban-rural differences are reduced, but not eliminated, when socioeconomic differences between urban and rural women are taken into account (P. Smith, 1983).

The effects of socioeconomic characteristics on marriage timing largely parallel their effects on fertility, and partly explain some of the patterns, such as the differences in the effects of female and male education. As will be seen shortly, these socioeconomic characteristics have similar effects on contraceptive use. Changes in these characteristics--such as increases in education for women--should therefore have dual and largely reinforcing effects in delaying marriage and increasing fertility control within marriage.

Other factors, some of them largely unrelated to development, also affect age at marriage. Ethnic, cultural, and religious differences are considerably important, and cannot be explained by reference to differences in socioeconomic status (e.g., Anderson, 1981; Casterline, 1980; P. Smith, 1976). Whether marriages are arranged by parents or not may make a difference. Parental control favors early marriage because search costs are not borne by the prospective partners and because the boy's parents typically prefer a docile, and therefore very young, woman (Nugent and Walther, 1982). On the other hand, institutionalized costs of getting married, such as bridewealth or dowry and wedding costs, as well as the costs of setting up a household, may delay marriage among the poor. Also affecting marriage timing are inheritance systems, because the partibility of land partly determines the availability of resources to set up a new household, as well as family strategies that may involve, for instance, postponing or preventing the marriage of one child who becomes responsible for looking after the parents (P. Smith, 1983).

Programs to Raise Age at Marriage

Attempting to affect such factors in order to raise age at marriage, with the ultimate aim of reducing fertility, is a complex matter. Some effect is produced by development, as later marriage becomes advantageous to larger groups. Improvements in women's status are particularly useful in contrast to direct augmentation of household income, which may lead instead to earlier marriage by making more easily available the resources a new household needs. Attempts to introduce and enforce official sanctions for late marriage often require a high level of political skill in order to mesh such strictures with cultural and religious beliefs. They can also fail. A legislated high minimum marriage age may be circumvented in several ways, or may simply mean more accelerated childbearing after marriage or more premarital conceptions (as a study of such legislated change in Bavaria in the 19th century demonstrates; Knodel, 1967). Nevertheless, the essential role that later marriage plays in fertility decline in developing countries argues that some attention must be paid to it. In addition, later marriage could itself make an important contribution to marital fertility control, improving women's life chances by enabling them to postpone acquiring responsibilities that interfere with their personal development.

Two attempts to raise age at marriage, in Tunisia and in China, both involved but did not rest mainly on legislated minimum ages. Tunisia instituted legal minimums of 15 for women and 21 for men in 1956, five months after independence, and raised the minimum for women to 17 in 1964. These minimums were accompanied by legal and social changes affecting women: polygamy and repudiation of wives were abolished, family planning services were gradually provided, and educational opportunities for women were expanded, so that the proportion enrolled in the first and second levels rose from 27 to 47 percent during the 1960s. The president supported these reforms strongly and criticized the practice of keeping women in seclusion. These and other fortuitous factors, such as substantial labor emigration of males, contributed to a decline in the proportion of women married in the age group

15 to 19 from 42 percent in 1956 to 6 percent in 1975 (Henry and Piotrow, 1979:129-130).

China, similarly, legislated minimum ages of 18 for women and 20 for men in 1950, as one of the first actions of the new communist government; no further legal change was made until 1980, when the minimums rose to 20 and 22. The initial minimums were instituted as part of an overhaul of marriage laws and an attempt to provide equal rights to men and women. Recognizing the limits of legal coercion, the Chinese declined to raise the minimums in 1957, but soon began to institute various forms of institutional and community pressure for later marriage as concern about population growth intensified. Substantial social change was simultaneously undermining the basis for early marriage (Henry and Piotrow, 1979). The change in legal minimums in 1980 was less than that officially recommended, and has therefore been interpreted as a relaxation of controls on marriage. This may have contributed to a recent increase in marriages and a spurt in the birth rate (Chen and Kols, 1982).

In both cases, legal minimums were introduced as part of broad attempts to give women an appropriate place in more modern societies. Alternate tightening and loosening of strictures on marriage timing took place, in recognition of continuing resistance to such measures. Little would have been accomplished without the changes in women's status and the economic transformations that occurred in both countries. Where attempts to raise female age at marriage are particularly important because of the prevalence of early marriage, these attempts will also necessarily involve broad-scale measures to accord women more rights and better opportunities within households as well as in society at large.

MODERATING BREASTFEEDING DECLINES

Effect on Fertility

Breastfeeding affects fertility because it inhibits ovulation; infant suckling stimulates the production of the hormone prolactin, which has this effect (McNeilly, 1979; Tyson and Perez, 1978). The anovulatory period produced by breastfeeding, which is difficult to measure, is closely approximated by the postpartum amenorrheic period. This is not a perfect indicator, however: especially at longer durations postpartum, some women, usually 5 to 10 percent, conceive without having menstruated (World Health Organization, 1981; Van Ginneken, 1977).

Data on breastfeeding durations and amenorrhea show a regular relationship, with amenorrhea typically covering a shorter period. In the absence of breastfeeding, amenorrhea lasts less than two months; in Lagos, Nigeria, breastfeeding averages twelve months and amenorrhea eight months; and in rural Senegal, breastfeeding averages twenty-four months and amenorrhea fifteen months (Bongaarts, 1983). When breastmilk is supplemented with other foods, frequency of suckling declines, prolactin levels fall, and the menses return more quickly (Simpson-Hebert and Huffman, 1981). In the interval of full, unsupplemented, breastfeeding, total suckling time seems to make no difference for prolactin levels or the duration of amenorrhea (Simpson-Hebert and Huffman, 1981), but short intervals between sucklings appear to promote amenorrhea (Konner and Worthman, 1980). Because of variations in breastfeeding practices related to such factors, the effect of breastfeeding duration on amenorrhea varies: statistically, a month of breastfeeding adds only 0.3 months to the birth interval in Guyana, Jordan, and Panama, but up to 0.7 months in Sri Lanka (Jain and Bongaarts, 1981).

The fertility-reducing effect of breastfeeding thus is enhanced not only by longer unsupplemented breastfeeding but also by more frequent sucklings, which are often connected with on-demand rather than scheduled feedings, no reduction in night feeds, and less use of pacifiers (WHO/NRC, 1983). Full breastfeeding should be limited by considerations of infant health. After four to six months, supplemental feedings are advisable for infant nutrition, though breastmilk can continue to provide an important source of protein and other nutrients for many additional months, and could still have some contraceptive effect (McCann and others, 1981).

Differentials and Trends

The great majority of women in developing countries--at least 70 percent, and more commonly over 90 percent in the countries covered in the World Fertility Survey--initially breastfeed their children. Estimates of the duration of breastfeeding cover a wide range, from 29 months in rural Bangladesh to 2 months in metropolitan Malaysia. In almost every one of 26 developing countries, urban breastfeeding durations are shorter than rural durations (by an average of three months) and metropolitan durations still shorter (by an average of two months more) (Ferry and Smith, 1983). Some urban contact is sufficient to reduce breastfeeding: Thai rural women who have lived in urban areas or who visit them frequently breastfeed less than other rural women, and those who migrate to urban areas breastfeed still less (Knodel and Debavalya, 1980). Urban-rural differentials remain significant when differences in education, female employment, age, and parity are taken into account (Jain and Bongaarts, 1981). In addition to these differentials, women whose husbands work in agriculture, and women who themselves are employed in agriculture, appear to breastfeed longer than other occupational groups (Jain and Bongaarts, 1981:11; Butz and DaVanzo, 1981; Knodel and Debavalya, 1980).

Like urban residence, education also exerts significant influence on breastfeeding reductions. The difference in breastfeeding duration between women with no education and women with at least seven years of education averages five months across 15 developing countries (Ferry and Smith, 1983:25). Less education than this also reduces breastfeeding in almost every country studied, but the decrease in duration is marked for those with seven or more years of schooling (Nag, 1983).

One explanation commonly offered for less breastfeeding among urban and educated women is the inconvenience when they work outside the home. However, the effect of female employment on breastfeeding is uncertain, and probably exaggerated. Employment does not affect initiation of breastfeeding, which usually takes place before the mother returns to work (Van Esterik and Greiner, 1981). Many studies show that employment has little effect on breastfeeding duration (Van Esterik and Greiner, 1981:190-191). For instance, Jain and Bongaarts (1981), studying eight developing countries, found no significant effect from whether a woman worked or where she worked after marriage, once other socioeconomic characteristics were controlled. Some studies in fact report that maternal employment, especially in agriculture, is associated with a longer duration of breastfeeding than not being employed (Van Esterik and Greiner, 1981). Breastfeeding may in fact require less time or attention than bottlefeeding, when the time required for food preparation is taken into account. Nevertheless, female employment could have some effect by leading to earlier weaning. Malaysian women who had recently been employed off the farm tended to completely wean their children at an earlier age (Butz and DaVanzo, 1981). Philippine women in a periurban setting breastfed if they worked close to home, but started mixed feeding earlier in they worked in a different barrio (Popkin and Solon, 1976). In addition, employment may lengthen periods between sucklings, leading to a briefer amenorrheic period (Nag, 1983).

Female employment is at best a partial explanation for breastfeeding declines connected with urbanization and increased education, but other possible explanations have not been sufficiently studied. Many women--up to 60 percent of Hungarian women in one study, for instance--give insufficient milk as the reason for stopping breastfeeding. That so many women would have this physiological problem is not credible (World Health Organization, 1981); experts in the field contend that virtually all women can produce enough milk for their infants (e.g., Jelliffe and Jelliffe, 1978). Several researchers have speculated that the perception of insufficient milk actually stems from lack of proper information (Gussler and Briesemeister, 1980; McCann and others, 1981; Huffman, 1982). Breastfeeding is not simply instinctual behavior; it has to be learned. Supporting social networks are important to ease mothers' anxieties and produce an environment where lactation can be successfully established and maintained (Raphael, 1979). The importance of such support is shown in the fact that Malaysian women who live with parents, in-laws, or other adult relatives are more likely to initiate breastfeeding than other women (Butz and DaVanzo, 1981). Few such close support networks are available in urban areas.

Urban areas may also encourage breastfeeding through the greater availability of convenient breastmilk substitutes (Nag, 1983). Indirect support for this argument comes from the association of reduced initiation of breastfeeding and shorter durations with higher income, regardless of education, in Malaysia (Butz and DaVanzo, 1981) and in Ibadan, Nigeria (Lucas, 1977). A final effect of the urban milieu which has not been quantified but which may be as important as any other is the association, reinforced by the media, of bottlefeeding with modern, high-prestige, role models and lifestyles (Huffman, 1982).

Education may have its effect through increasing identification with such role models and easing access to substitutes. Furthermore, educated women are more likely to follow medical advice. Until relatively recently, Western medical practitioners generally discouraged breastfeeding. The medical literature did not clearly support breastmilk as a superior infant food until the late 1960s (Butz, 1981). This change in medical opinion accompanied a change toward greater prevalence of breastfeeding among more highly educated women in developed countries. In the U.S., for instance, college-educated women are the most likely to initiate breastfeeding and breastfeed for the longest durations--which are still relatively short, however (Hirschman and Hendershot, 1979). Changes in medical opinion could eventually change the relationship of education to breastfeeding in developing countries.

Consistent with these socioeconomic differentials, declines in breastfeeding over time have been increasingly observed in developing countries. Consecutive national samples have been studied in Thailand, Taiwan, China, and in Mexico, and personal life histories obtained from representative national samples in Malaysia and Korea. In each case, declines either in proportion initially breastfed, in breastfeeding duration, or in both, have been confirmed. In Thailand, for example, the average breastfeeding duration declined in the decade 1969-79 by about five months, from 22.4 to 17.5 months in rural areas and from 12.9 to 8.4 months in the cities. Community studies, clinic records, and similar information indicate that, in many other developing country populations too, children born more recently are more likely to be partly or entirely bottlefed (McCann and others, 1981:535).

The implications of these declines for infant health are not favorable. Considerable health risks are connected with bottlefeeding--particularly in circumstances where infant formula may be improperly prepared, sterilization is not possible, and mothers cannot afford an adequate supply and may use nonnutritous substitutes instead. Substantially higher infant mortality rates and a higher incidence of infections, especially diarrhea, are reported among those not breastfed or breastfed only for a short period, despite the fact that these children are often in families with higher income and better education.

In addition, these breastfeeding declines carry significant implications for fertility control. In the absence of fertility regulation, and under standard conditions for the other fertility behaviors, a reduction in the mean duration of breastfeeding from three years to one month would lead to a doubling of total fertility, from 5 to 10 (Bongaarts and Menken, 1983). Maintaining fertility unchanged should the duration of lactational amennorhea fall to three months would require roughly a doubling of contraceptive use in Thailand and Indonesia, and close to an eight-fold increase in Pakistan (Lesthaeghe, 1981). It has been estimated that, as late as a decade ago, breastfeeding provided more protection against conception in the developing countries than family planning programs (Berg, 1973; Rosa, 1974). Such protection is difficult and costly to replace.

Breastfeeding Promotion

Some decline from the very long breastfeeding durations--two to three years--reported in some countries is probably inevitable. To what degree these declines can be moderated is difficult to say, given the uncertainty about its causes. If the greater convenience of bottlefeeding is the main explanation, it will be difficult to halt breastfeeding declines, and necessary instead to focus on providing compensatory contraceptive coverage. It appears more likely, however, that breastfeeding declines also result from women's lacking guidance and support, imitating inappropriate models for behavior, and having insufficient knowledge about the health benefits of breastfeeding. Thus breastfeeding promotion programs should have some potential.

Providing women with confidence and the knowledge to breastfeed successfully is critical. Hospital and clinic routines often discourage breastfeeding by separating mother and child, offering unnecessary supplementary bottlefeedings, and similar measures; routines should be restructured to encourage breastfeeding and make it more convenient. In the past decade over fifteen countries have adopted policies to encourage breastfeeding, introducing such measures as prenatal education and legislation to control marketing and promotion of breastmilk substitutes. Small surveys indicate that such policies have some success. In Port Moresby, Papua-New Guinea, for instance, changes in hospital practices, limitations on advertising and distribution of formula, and similar measures were reported to increase the proportion breastfed among children under two from 65 to 88 percent (McCann and others, 1981).

Integrating breastfeeding promotion into family planning services can be a useful step (Baer, 1981). Integrated clinics, which are responsible for both pediatric care and family planning, can have a positive effect on breastfeeding, as they do in Malaysia (Butz and DaVanzo, 1981). This is so despite the fact that private maternity clinics near these government clinics in Malaysia have the opposite effect of discouraging breastfeeding. The advantages to this type of integration include the guidance that can be provided for breastfeeding women, should they want to postpone or avert a future birth, about proper timing and use of contraception. Breastfeeding women who want to avoid pregnancy are numerous in some developing countries: according to Contraceptive Prevalence Surveys, such women make up 10 percent of all married women of reproductive age in Mexico, 15 percent in Peru, and 16 percent in Honduras (Boulier, 1984).

Until six months postpartum, a fully breastfeeding woman requires no contraception. Beyond that point, breastfeeding does not provide full protection against pregnancy, and contraception should be used. If the woman continues to breastfeed--which is still beneficial for infant health, though food supplementation is also advisable--she should if possible avoid combined estrogen-progestin contraceptive pills because of their effects on breastmilk, but other contraceptive methods are entirely acceptable.

Women sometimes regard breastfeeding and contraception as substitutes. Many are aware that breastfeeding has some fertility effect: a Guatemalan study showed that three-quarters of mothers believed breastfeeding postpones conception (Butz and Habicht, 1976:215), and a 1976-77 Malaysian survey showed that 60 percent believed conception was more difficult while breastfeeding and 20 percent thought it was impossible (DaVanzo, 1980). Empirically, an inverse relationship is sometimes observed between breastfeeding duration and contraceptive use within different socioeconomic groups (Jain and Bongaarts, 1981; Johnson-Acsadi and Szykman, 1981; Millman, 1982). The scientific evidence suggests, however, that it is more useful to think of breastfeeding and contraception as complements in delaying pregnancy and, partly as a result, improving infant health.

MONITORING OTHER BIOSOCIAL DETERMINANTS

Although other biosocial determinants have less demographic and practical significance, some awareness of their effects, particularly for postpartum abstinence and sterility, is useful especially for sub-Saharan Africa.

Postpartum Abstinence

Postpartum abstinence may accompany breastfeeding, and will have fertility effect if it extends beyond the anovulatory interval. It has an effect in one Indonesian village studied between 1967 and 1971, for instance, where breastfeeding lasted 16 months and postpartum abstinence 23 months (Hull, 1975). The longer durations of postpartum abstinence are reported mainly for African societies, however, and the trend in the sub-Saharan region toward shorter abstinence probably adds to the fertility increases associated with breastfeeding declines.

The fertility effect of postpartum abstinence may be illustrated from one study in Lagos, in which the median duration of postpartum abstinence was more than twice as long as the duration of amenorrhea in each education group. Indices for the effect of amenorrhea indicated a 6 to 30 percent reduction from theoretically achievable fecundity levels, whereas similar indices for abstinence indicated a reduction of 18 to 28 percent, suggesting a roughly comparable influence of abstinence (Lesthaeghe, Page, and Adegbola, 1981:172).

The taboo on postpartum intercourse is believed to have been, at one time, virtually universal in traditional sub-Saharan Africa. As a customary means of child spacing used largely to protect the health of the child and the mother (Rehan and Abashiya, 1981), it was enforced by a variety of measures, including physical separation of the spouses, public ridicule, and even accusations of withcraft in the event of a child death. The longer taboos are now found mainly in west Africa. The practice has been eroded elsewhere, from the northern Sahel to southern Africa, by a variety of factors, including resort to withdrawal instead of abstinence, or to modern contraceptives; the reduction in polygyny, which formerly provided an alternative sexual outlet for the husband; intensive Christianization in some cases; and the availability particularly in the Lacustrine areas of milk cows, reducing the need to avoid pregnancy in order to prolong breastfeeding (Schoenmaeckers and others, 1981). Further erosion of postpartum taboos is likely. Contraception contributes to this erosion, but is nevertheless important to provide as an alternative child-spacing method.

Other Biosocial Factors

Aside from breastfeeding and postpartum abstinence, a few other biological factors affect the likelihood of conception and birth, including sterility, frequency of intercourse, spontaneous intrauterine mortality, and the timing of the end of the reproductive period. None of these has a major demographic effect comparable to that of breastfeeding, except for sterility in some areas.

Primary sterility, or involuntary childlessness up to the end of a woman's reproductive life, usually affects about 3 percent of women, but reaches 20 percent in some African and New Guinean societies. Secondary sterility refers to parous married women who, despite exposure to the risk of pregnancy, fail to conceive for two years or more; it may also reach demographically significant levels (Gray, 1983). Largely because of sterility, total fertility is estimated to be only 4.5 in Gabon, where 18 to 46 percent of women are childless (Belsey, 1976). An even more extreme case is that of the Azande, on the Sudan-Zaire border, for whom a total fertility rate under 2 has been reported (Page and Lesthaeghe, 1981). In such cases, high levels of intrauterine mortality--associated with such health problems as venereal syphilis, malaria, and malnutrition (Gray, 1983)--may also contribute to low fertility.

A high incidence of primary and secondary sterility is often associated with pelvic inflammatory disease (PID), defined as any supracervical infection involving the uterus, fallopian tubes, ovary, or other internal pelvic organ. Gonorrhea is a major cause of PID; it has been related to levels of sterility in studies in Uganda and Upper Volta (Gray, 1983). The mass use of penicillin has substantially reduced the incidence of gonorrhea in the past in western Zaire (Page and Lesthaeghe, 1981), New Ireland (Papua-New Guinea), Martinique, and Jamaica (Gray, 1983). Such reductions in sterility may contribute to the increases in fertility that often takes place early in the fertility transition.

Frequency of intercourse also affects fertility: the greatest likelihood of conception is associated with a coital frequency of three in the six-day period around the time of ovulation (Barrett and Marshall, 1969). However, information about frequency of intercourse across societies is limited and unreliable, and any demographically significant effect--apart from the systematic reduction in frequency of intercourse with age--is difficult to verify. Data from the United States indicate that couples using effective means of contraception have higher than average coital frequencies, whereas couples not contracepting who want no more children have much lower coital frequencies (Westoff, 1974). No comparable analysis exists for developing countries (but see Muangman and others, n.d.). It has been argued that coital frequencies must be relatively low in developing countries because of low energy levels and little privacy; it has also been argued that coital frequencies should be high because of the absence of other forms of recreation. Neither view has any empirical support (Nag, 1983).

PROMOTING FERTILITY REGULATION

Once past the earlier stages of the fertility transition, in which the influences of marriage and breastfeeding largely cancel each other out, the largest contribution to fertility decline is made by deliberate fertility regulation. Two factors are important in this: the increasing availability, acceptability, and efficiency of contraceptive and abortive methods; and progressive reductions in household fertility preferences and goals. Family planning programs are largely responsible for the diffusion of fertility regulation methods, and socioeconomic and cultural change--with some assist from family planning programs--largely responsible for lower fertility preferences.

Trends, Effects, and Differentials

Contraceptive Prevalence

The combined effects of family planning programs and development can be traced in the substantial rise in contraceptive use from the early 1960s to the present for many countries of Asia and Latin America. The number of contraceptive acceptors in large-scale family planning programs went from a few tens of thousands in the early 1960s to approximately 25 million in 1980. The rapidity with which contraception spread in many countries is startling. In the five years between 1973 and 1978, for instance, contraceptive prevalence in Mexico more than tripled, going from 13 to 41 percent of married women of reproductive age (Mauldin, 1983). Similar though slightly less rapid expansions in contraceptive use, involving increases in prevalence of at least 3 percentage points a year, have been documented for El Salvador, Jamaica, and Panama, in the Americas, and for Hong Kong, Singapore, Thailand, and West Malaysia, in Asia (United Nations, 1984).

These rapid increases are not universal, of course, and still leave most countries short of prevalence levels in developed countries. In developed countries, prevalence is between 65 and 80 percent, with some exceptions (e.g., only 51 percent of Spanish married women of reproductive age use contraception). A few developing countries have comparable prevalence levels: Hong Kong at 80 percent; Singapore at 71; Puerto Rico at 69; and Costa Rica at 65 (United Nations, 1984). Though the figures are somewhat uncertain, China is probably above 60 percent (Chen and Kols, 1982), not far behind these much smaller and much more advanced countries. At the opposite extreme are most countries of sub-Saharan Africa, where contraception is almost entirely absent. Similarly, very low prevalence levels are reported in several countries of South Asia: Afghanistan, Pakistan, and Nepal are under 10 percent, and Bangladesh about 13 percent. Somewhat wider contraceptive use exists in India, where prevalence is estimated to be close to 25 percent. Among the continents, Asia consequently shows the greatest diversity in contraceptive prevalence, with higher rates in East and Southeast Asia and lower rates to the west. Africa is much more homogeneous. The exceptions to the very low prevalence levels are at opposite ends of the continent: Tunisia and Egypt, with prevalence levels of about 25 percent, and South Africa and Mauritius, with prevalence levels about double that. Latin America and the Caribbean, finally, has the highest over-all contraceptive prevalence levels, with a majority of countries between 30 and 55 percent. Guatemala and Haiti, with prevalence at about 20 percent, are the laggards in this region (United Nations, 1984; Nortman, 1982:Table 2; Ross, 1983).

In every developing country region, and in practically every developing country, considerable scope therefore exists for increased contraceptive use. Prevalence levels in developed countries need not be taken as limits. Developing countries diverge from the transition experience of developed countries in several ways, and prevalence levels could eventually exceed typical levels in developed countries, at least for particular periods, given population pressures and related problems. Additional scope for contraceptive promotion exists because the methods in use are not always the most effective, although developing countries have taken better advantage than the developed countries could of modern contraceptive technology.

Effects of Contraceptive Methods

More modern and more effective methods--sterilization, the pill, injectables, and intrauterine contraceptive devices (IUDs)--predominate among the methods used in most developing countries. The mix among and other methods varies greatly from country to country, but generally the modern methods are proportionally more popular than in developed countries, in several of which withdrawal, as well as condoms, still account for a considerable proportion of use.

Among all contraceptive methods, the pill is most often the leading one. In Latin America and the Caribbean, it usually accounts for between 20 and 40 percent of users; in Asia, the percentages vary much more, but over half of all contraceptive use involves the pill in Indonesia, Iraq, Syria, and Malaysia (United Nations, 1984).

Female sterilization has increased its share of contraceptive use in almost all trend data that can be examined, and in a number of countries is now more popular than the pill (United Nations, 1984). Simpler surgical procedures--laparoscopy and minilaparotomy--were developed in the 1960s and widely disseminated in the 1970s, greatly reducing the cost and discomfort of the operation (McCann and Cole, 1980). Female sterilization accounts for 50 percent or more of contraceptive use in four Central American or Caribbean countries: Puerto Rico, El Salvador, Panama, and the Dominican Republic. It is estimated that 15 to 22 percent of all couples of reproductive age are sterilized in at least nine Asian countries, including China and India (Ross, 1983:568). Male sterilization, despite still being a simpler and safer procedure than female sterilization (Ross and Huber, 1983), has seldom been provided by family planning programs outside South Asia and almost never commands more than 2 percent of users.

Of the other contraceptive methods requiring supplies, IUDs and condoms are each chosen by under 10 percent of users in the majority of countries. Shares of each method have been essentially static, with increases in some countries being cancelled out by decreases in others. In a few countries, however, these methods are much more important. China, which has designed many of its own IUDs, may have half of all users on this method; Indonesia has roughly a quarter on IUDs. The condom, on the other hand, is particularly popular in Singapore and in Trinidad and Tobago, accounting for almost 30 percent of users in each case (United Nations, 1984).

Although there are other minor methods, only two nonsupply methods generally considered "traditional," rhythm and withdrawal, will be mentioned here. Rhythm commands about the same share of contraceptive users, across countries, as IUDs and condoms, and withdrawal a somewhat smaller share. An unusually high proportion of users resort to rhythm in Peru; at 41 percent, Peru has as high a proportion as Poland and Romania, where rhythm is most used among the developed countries. Large proportions--about a quarter of all users--also rely on rhythm in Haiti, Sri Lanka, and the Philippines. Withdrawal accounts for a quarter to half of all users in Lebanon, Turkey, the Philippines, and Haiti (United Nations, 1984).

Several of the modern methods are, in theory, close to 100 percent effective in preventing pregnancy. In actual use in developing countries, however, effectiveness is typically lower because of failure to use a method properly and irregularity in its use, which may be aggravated by weak motivation to avoid pregnancy, particularly among those choosing less reliable methods. The monthly risk of conception for a cohabiting, noncontracepting couple is typically about 20 percent, and the proportional reduction in this risk from using a method is termed its use-effectiveness (Bongaarts and Potter, 1983:65). Sterilization may be assumed to have use-effectiveness of 1.00 (Bongaarts, 1982). From Philippine data, the use-effectiveness of the IUD is estimated at 0.96, the pill at 0.95, rhythm at 0.80, and condoms at 0.62 (Laing, 1978; see also Goldman and others, 1983). Although the rating for IUDs is close to the rating in the U.S., the ratings for pills and condoms are much lower, and may be even lower in other countries with lower literacy levels (Bongaarts and Potter, 1983:70; Bongaarts, 1982:189). The combined use-effectiveness of the entire mix of methods in a country ranges from 0.75 to 0.94 across 22 developing countries, with most countries close to 0.85 (Bongaarts and Kirmeyer, 1982:384).

At this average level of use-effectiveness, an increase in contraceptive prevalence from 10 to 30 percent should be associated with a fall in the total fertility rate of about 20 percent, and an increase from 30 to 50 percent prevalence with a fall in the total fertility rate of about 25 percent. On the other hand, if prevalence stays at 50 percent and use-effectiveness rises from 0.85 to 0.95, total fertility should fall about 10 percent, also a significant amount. These relationships are not exact; the fertility effect of contraception depends not only on prevalence and method choice but also on factors like continuation, or how long a couple continues to contracept, and timing of use, since earlier use, while a couple is more fecund, should lead to the avoidance of more potential births (Bongaarts and Kirmeyer, 1982:393).

Abortion Incidence and Fertility Effects

The contribution of abortion to fertility regulation is much more difficult to determine. Although it is one traditional method of fertility regulation in many developing countries (David, 1983), much less is known about its incidence than about contraception. Increases in incidence have accompanied fertility decline in a few countries, like Korea in the 1960s and Singapore in the 1970s (where the abortion ratio went from 4 per 100 known pregnancies in 1970 to 30 per 100 in 1980). Even in these few cases, however, the suspicion is strong that substantial numbers of abortions were still unreported (Tietze, 1983). Abortion ratios as high as 43 are reported in Cuba. The incidence of illegal abortion in many other developing countries is impossible to determine, but is not likely to be negligible. For Latin America, for instance, some studies suggest high and possibly increasing incidence, especially in urban areas (David, 1983).

Legal restrictions on abortion make the collection of data difficult. Legal sanctions may affect incidence less, however, than the limited availability of services. Abortion appears to be more prevalent in those countries of East and Southeast Asia, like Korea and Thailand, where it is legally restricted but widely available, in contrast to other countries like India and Zambia where abortion is legal but trained personnel and equipment difficult to find (David, 1983; Tietze, 1983).

It has been argued that no significant decline in birth rates has been achieved, in developed or developing countries, without much recourse to abortion (Potts, 1972; van der Tak, 1974; David, 1983). Dramatic and sudden fertility declines have often taken place when elective abortion was made available to populations strongly motivated to control fertility but using only traditional contraceptive methods (David, 1983). Where abortion is culturally acceptable, therefore, making adequate facilities available--particularly for menstrual regulation, which is a simple and cheap procedure--could have particularly favorable consequences for fertility control. Improving abortion facilities should also reduce mortality and morbidity resulting from illegal, and often incompetent, practice.

Differentials in Contraceptive Use

Household comparisons show that contraceptive use rises fairly steeply with number of living children, and then tends to plateau (though some countries are exceptions), often around three children. Since at least some contraception is used to limit rather than space births, this pattern is expected. A parallel pattern appears across age groups: contraceptive use increases with age until about 35 or 40, and then declines, either because contraceptive protection is no longer necessary or because older cohorts are less inclined to contracept (Nortman, 1982; Carrasco, 1981). These patterns are modified over time: the average age and family size of family planning program acceptors declines, so that contraceptive use, often for spacing purposes, becomes proportionally more likely even among those with no children or only one child (Ross, 1983).

Women who have had a child die are less likely to use contraception (Johnson-Acsadi and Weinberger, 1982; Pebley and Brackett, 1982). The impact of a child death is not large, but it is consistent and not attributable to other factors like education.

Differentials in contraceptive use between education groups appear consistently across countries. Both wife's education and husband's education increase contraceptive use, though wife's education is typically more important (Johnson-Acsadi and Weinberger, 1982). By itself, however, education is insufficient to guarantee high levels of contraceptive use: women with many years of education, in one country, may use contraception less than women with no education, in another country. Among married, fecund, nonpregnant women in Kenya, 22 percent of those with nine or more years of education use contraception, as opposed to only 7 percent of those with five or fewer years of education. In Mexico, on the other hand, contraceptive prevalence in the low education group is 31 percent, as opposed to 72 percent in the high education group (Pebley and Brackett, 1982:Table 2). Such differences between education groups are slightly reduced, but by no means eliminated, when other socioeconomic characteristics are taken into account.

The gap in prevalence between education groups tends to be largest when overall prevalence is at intermediate levels. Thus relatively small--though still fairly substantial--differentials by education are found in Bangladesh, Nepal, Pakistan, and Kenya, where overall prevalence is low, as well as in South Korea, Fiji, and Costa Rica, where prevalence is much higher (Johnson-Acsadi and Weinberger, 1982).

Differences in contraceptive prevalence between urban and rural areas are somewhat less predictable. Urban areas generally have higher prevalence levels than rural areas, and metropolitan areas or principal cities still higher levels (Lightbourne, 1980). But these differences are substantially narrowed when factors like parity, education, and contraceptive availability are controlled, and are statistically significant only in some countries (Pebley and Brackett, 1982). Like differences due to education, differences due to urban or rural residence tend to moderate when contraceptive prevalence reaches high levels, and are in fact quite small in developed countries (Lightbourne, 1980:30).

Some differences in contraceptive use also appear by occupation: prevalence is lower if the woman works in agriculture than if she does not work or works in a nonagricultural job, and also lower if her husband works in agriculture. Differences in education and residence account for a large part, though not all, of these contrasts (Johnson-Acsadi and Weinberger, 1982; Pebley and Brackett, 1982).

It should not be assumed, from this discussion, that development-related indicators have a uniformly positive effect on contraceptive prevalence. Indonesia is worth considering as an important counterexample with recent and substantial fertility decline. Using a level of living index based on housing and utilities from the Indonesian Fertility Survey of Java and Bali, Freedman and others (1981) found that contraceptive use was greatest at the highest and lowest levels of living. That is, among married, fecund, nonpregnant women, 41 percent of those with a high level of living and 38 percent of those with a very low level of living were using contraception, as opposed to 29 to 31 percent of those in three intermediate groups. Adjusting for other household characteristics narrowed the differentials only slightly. Comparisons of villages also suggested that higher prevalence was not related to higher levels of living. The absence of particular social amenities in a village, like electricity and television, was in fact related to higher contraceptive use, despite the fact that these villages were likely to be farther from major towns. Part of the explanation for this pattern has to do with the ability of the family planning program to reach rural areas, which contributes to smaller urban-rural differences in Indonesia, as in a few other countries (Johnson-Acsadi and Weinberger, 1982:78-79); other factors, including economic or possibly political pressures on the very poor, may also be at work (Freedman and others, 1981:33).

A mix of development measures, especially education and health, and measures to provide contraception and abortion or to directly influence fertility preferences therefore appear preferable to exclusive reliance on development. That providing family planning services can itself make a difference is the burden of the next section.

Family Planning Programs

Information about contraception and access to those methods requiring supplies or services are provided through government as well as private programs, often at heavily subsidized prices. After a brief description of what are currently provided, the effects of such programs will be assessed, first in the aggregate with respect to their effect on fertility and then from the perspective of a few program elements and their effects on contraceptive use.

Governments in 70 or so developing countries, covering all but 6 percent of the population of the developing world, currently support family planning programs. Where contraceptives were originally provided through other sources--private programs, commercial outlets, and medical practitioners, for instance--these sources tend to decline in relative importance, though they may actually grow in numbers of acceptors, as official programs develop.

Though official programs offer a variety of methods, each typically emphasizes a single one. This emphasis is responsible for much of the variation in method prevalence earlier discussed. Thus the method that is most often the leading one, the pill, is also the method most often provided in over half of all country programs. For instance, in Indonesia and Egypt, three-fourths of users who obtain supplies from the program are on the pill, and in Mexico over half are in this group. Female sterilization, with a steadily increasing share of users, is the leading program method in several countries, including Sri Lanka and India. Countries where the IUD is popular are generally those where programs emphasize this method (Nortman, 1982:Table 17). Nonprogram sources tend more often to provide methods like the condom. In several countries they also provide sterilization proportionally more frequently than the official program. In Costa Rica and the Dominican Republic the official programs predominantly provide the pill, but private sources--which in these countries provide more coverage--have many more sterilization acceptors (Carrasco, 1981:22).

Evaluating the effects of these programs is complicated by several factors. Several earlier family planning programs, especially in East Asia, were established in countries where substantial fertility decline was already in progress. Initial optimism about their effects was probably exaggerated, because the simultaneity between program expansion and continued fertility decline in such cases does not permit any conclusions about program effects (Hernandez, 1981). In South Asian countries with programs established in the 1950s and 1960s, on the other hand, little movement was evident in fertility through the late 1960s. Programs by then were still mostly clinic-based and did not attempt community outreach, which probably limited their effect (Kols and Wawer, 1982).

Family planning programs spread rapidly in the late 1960s and early 1970s. Between 1965 and 1975, governments in 56 developing countries adopted policies favorable to family planning, either for demographic or health and human rights reasons (Nortman, 1982:42-52; cf. Cuca, 1979:10). This expansion was accompanied by intensification of efforts, in many countries, to base services within communities, to provide contraceptives through as many channels as possible, and to train and utilize paramedical personnel to personally contact and follow up as many potential users as possible (Cuca, 1979:22).

At least partly as a consequence, more recent research has turned up increasingly favorable verdicts on program effects. Cross-national research will be considered first, followed by experimental studies, and then by studies of key aspects of programs.

Cross-National Comparisons

A handful of cross-national studies have demonstrated that more active family planning programs lead to greater fertility decline than can be expected from socioeconomic development along (Srikantan, 1977; Faruqee, 1979; see also King, 1974). One particularly influential study, by Mauldin and Berelson (1978), is worth detailed consideration. The authors attempted to assess the independent contribution of family planning programs to fertility decline in the 1965-75 period, net of the contribution of several development indicators: adult literacy, primary and secondary enrollment, life expectancy, infant mortality, per capita GNP, urbanization, and the share of the labor force outside agriculture. Using an index of family planning program effort for each country based on consensus ratings of activities or policies in 15 areas, they found that family planning effort contributed significantly to fertility decline.

The most serious objection to this study is that family planning effort may itself be the result of preexisting demand for contraception generated by development (Demeny, 1979). It may therefore simply displace traditional nonsupply methods, services already available through the private sector, or services that would become available otherwise. Almost all countries with moderate or strong program effort in Mauldin and Berelson's analysis were in fact above the median in development levels.

To take the objection into account, Boulier (1984) reran the regressions including prior fertility decline (from 1960 to 1965) as a determinant of 1965-75 fertility change and treating family planning effort as endogenous. Sixty-eight developing countries were included in this analysis, and several different specifications--using total fertility or the crude birth rate, predicting levels and first differences--attempted. Fertility was fairly well predicted in this analysis, R^2 being usually 0.70 or higher.

The analysis confirmed the dependence of family planning effort on previous fertility decline, as well as on adult literacy. Despite this, it also showed that family planning effort contributed significantly to subsequent fertility decline. For the average country, 1965-75 decline in the total fertility rate was 0.5 points, relatively small because many countries with essentially stable fertility were included. Previous fertility decline accounted for 33 percent of this decline, socioeconomic change accounted directly for 27 percent, and family planning effort accounted for 40 percent.

Experimental Studies

Additional evidence for the contribution of family planning programs to fertility reduction comes from experimental studies. One important study was conducted in rural, deltaic, largely inaccessible Matlab, Bangladesh. Comprehensive family planning services were provided through trained local women in 70 villages, while a reliable registration system kept track of vital events. Quarter-by-quarter fertility rates for these villages were closely comparable to those for 79 other Matlab villages for the four years prior to the project, but diverged over the two subsequent years. The 22 percent fertility reduction due to the program in the experimental villages was evident in every period over these two years despite substantial seasonal variation in fertility and fluctuations due to famine (Phillips and others, 1982).

Of the numerous other experiments with family planning programs, only a few, like this Matlab study, measured fertility or contraceptive prevalence before and after the experiment and included control groups not provided with the specific family planning services. Most of these experiments show some program effect, as a few capsules (Boulier, 1984) illustrate:

- In Boyaca, Colombia, household distribution of contraceptives was combined with basic health services between 1977 and 1981. Contraceptive prevalence, initially 16 percent, rose to 43 percent in the control (no distribution) area and to 53 percent in an area where only antihelminthics were distributed, as contrasted with 59 percent in an area where oral pills were distributed.

- Household delivery of maternal and child health services and contraceptives was implemented in 1976-77 in San Pablo Autopan, Mexico. Contraceptive prevalence rose from 5 to 9 percent in the surrounding, control, area, but from 7 to 25 percent in the experimental area.
- Between 1981 and 1983, methods for household delivery of contraceptives were tested in Rio de Janeiro, Brazil. No differences in subsequent contraceptive prevalence were found between control and experimental groups.
- On the island of Cheju, Korea, oral pills and condoms were distributed through home visits in 1976-79 and referrals were also made for IUDs and subsidized tubal ligations. Areas of rural Korea served by a less intensive family planning program were used as control. Control-area contraceptive prevalence rose from 26 to 45 percent; contraceptive prevalence in Cheju rose from 18 to 35 percent. What conclusion to draw from these relative gains in prevalence is not clear. However, comparison of fertility declines had a clearer message: control-area fertility fell 29 percent, while Cheju fertility fell 35 percent, the greater decline being attributable mainly to tubal ligations.
- Postpartum women received free pills and condoms in home visits in 24 townships of Taiwan in 1974-75. Contraceptive prevalence rose 30 percent in control areas, 75 percent in experimental areas.
- In some areas of the island of Bohol, the Philippines, maternal and child health and family planning services were delivered through village workers, including midwives and traditional birth attendants, in 1974-79.

Fertility declined 9 percent in nonproject areas of the island, 15 percent in project areas.

- Maternal and child health and family planning services were provided in 1971-78 in a comprehensive rural health program in Jamkhed, Maharashtra, India. Contraceptive use among eligible couples was below 10 percent by 1976 (near the end of the experimental period) in a nonprogram area, and the crude birth rate was 37 per thousand. In the program area, contraceptive use rose from 3 to 51 percent by 1976, and the crude birth rate fell from 40 to 23.
- The Kinga social marketing experiment in Kenya between 1972 and 1975 gave shopkeepers incentives to distribute condoms and also supplied extensive advertising and motivational activities. Contraceptive prevalence fell marginally in a control area (from 20 to 19 percent) but rose in the experimental area (from 21 to 25 percent).
- The Danfa project in rural Ghana in 1970-78 tested alternative methods of delivering health and family planning services. Contraceptive acceptance and fertility did not change over the period in the control area. Where contraceptives were distributed, acceptance rose and fertility fell. Both these trends were more marked in areas where contraceptive distribution was combined with health and nutrition education, and still more marked in areas provided with comprehensive health services.

Experimental effects were small in the condom marketing scheme in Kenya, and nonexistent in the Rio de Janeiro study. The Rio study was, however, the only one conducted exclusively in an urban area where contraceptives were easily available. With these exceptions, the experiments listed, though conducted in widely varying communities at different levels of development, all show that increased availability of contraceptives through family planning programs does contribute to higher contraceptive prevalence or lower fertility than there would be otherwise.

Contraceptive Information and Access

Complementing studies of the effects of particular family planning projects are studies of the mechanisms through which they operate. Programs are meant to increase information about and access to various contraceptive methods, and several studies, mostly using World Fertility Survey and Contraceptive Prevalence Survey data, show that better information and access do increase contraceptive use.

Comparisons in such countries as Mexico, Korea, Thailand, India, and Bangladesh indicate that contraceptive prevalence is higher in those communities with more sources of family planning supplies, even when differences in development levels across communities are taken into account (Tsui and others, 1981; Entwisle and others, 1982). In India, for instance, comparisons of districts showed that a 10 percent increase in the number of clinics per capita was associated with a 3 to 4 percent increase in the combined acceptance rates of IUDs and sterilization. Similarly, a 10 percent increase in the number of extension workers per capita raised acceptance rates by 4 to 6 percent (Simmons, 1971).

Even more important than the physical availability of contraceptives is personal knowledge of a source for services and supplies. The percentage of married women who know of an outlet varies from 6 percent in Nepal (and probably lower in many sub-Saharan African countries) to close to 90 percent in Costa Rica and Korea. Among those who know of an outlet, contraceptive prevalence is 10 to 35 percentage points higher than among those who do not, after controlling for socioeconomic and demographic differences between these groups. This effect is mainly on use of more efficient methods; traditional nonsupply methods are not affected. Knowing of an outlet is less of an advantage where it is perceived to be distant, as in Nepal and Kenya. Knowing a specific outlet also seems to matter a little less where contraceptive prevalence is already high (Rodriguez, 1978; Pebley and Brackett, 1982).

Attempts have been made to determine if distance to an outlet limits prevalence. In Nepal, where median travel time to an outlet is two hours, distance has this effect (Cornelius and Novak, 1983). In most other cases that have been studied, travel times are much shorter and interfere with contraceptive use only slightly, if at all (Lewis, 1983; Boulier, 1984). Similarly, high contraceptive prices can discourage use, but the typical variations in family planning programs have limited effect (Lewis, 1983). One factor, insufficiently researched, that seems to make much difference to prevalence and to choice of an outlet is the quality of care and staff attention (Lewis, 1983).

Acceptability of Fertility Regulation

One critical effect of family planning programs, more difficult to quantify than information or access, is the legitimation of the practice of fertility regulation. Information and access by themselves do not guarantee use, even among those already motivated to limit their families. Also required is the acceptance of the idea that fertility regulation is a normal, rather than a proscribed and dangerous, activity.

For sub-Saharan Africa, as well as for other developing regions one or two decades ago, contraception and abortion may be considered innovations with which most people have little previous experience (Knodel, 1977). Though traditional methods of regulating births probably exist in all cultures, these are usually less effective and in practice restricted to small minorities

(Coale, 1973). Accordingly, modern means of fertility regulation, when they are first introduced, sometimes meet with reservations, skepticism, fear about health effects, and disapproval from traditional leaders.

The situation has changed greatly in many countries of Asia and Latin America, as one would expect as any innovation loses its novelty and strangeness and becomes integrated into familiar marital patterns (Bogue, 1983). Problems with the acceptance of contraception as legitimate behavior persist nevertheless, especially in backward or isolated rural communities, as well as in most of sub-Saharan Africa, where family planning programs have made little headway.

To a great extent the increase with development in the acceptability of the idea of regulating fertility is a natural process, in which a family planning program mainly serves as a catalyst. Programs to spread information and access assist in making contraception more familiar, and sensitive manipulation of cultural symbols through information-education-communication programs may do much to disarm public suspicion of new contraceptive technologies. Convincing appropriate opinion leaders, reaching and working with interpersonal networks within the community, and providing safe and effective services in nonthreatening settings are all useful in increasing acceptability. Even with such efforts, however, the diffusion of approval for fertility regulation may still be largely patterned by social forces. Thus acceptance appears to spread more rapidly in more compact populations, especially island populations, with good communication systems and widely shared values, norms, and institutions (Retherford and Palmore, 1983). Social homogeneity favors the spread of contraception, and ethnic and cultural barriers retard it. Studies of the fertility transition in Spain, Germany, and Belgium have demonstrated graphically how marital fertility regulation spreads within an ethnic group, and is abruptly interrupted in its course by linguistic boundaries (Coale, 1973). Similar boundaries exist in multiethnic developing societies, and may constitute a major obstacle to spreading contraception in sub-Saharan Africa.

Development and Program Effects

As earlier observed from cross-national comparisons, more intensive family planning programs are linked to higher literacy levels. Countries at low levels of development generally show lower family planning effort (Mauldin and Berelson, 1978). If it were possible to institute good programs at low development levels, would it be worthwhile--or is some development a prerequisite for program success? The evidence on this issue is so far limited. It appears, however, that programs have some effect at all levels of development, though their effect may be smaller at lower development levels.

A detailed comparison of fertility changes in almost 400 administrative regions of Taiwan, China provides a little evidence (Schultz, 1971). Two types of family planning workers were used over the period 1964-69, Village Health Education Nurses and Pre-Pregnancy Health Workers. A 10 percent increase in the person-months put in by the nurses was linked to a 10 percent decrease in the total fertility rate, and a 10 percent increase in the person-months put in by health workers to a 20 percent decrease in total fertility. In addition, however, these program inputs were more effective in agricultural regions with low child mortality and high proportions of children enrolled in school, as well as in regions where child mortality was declining more rapidly and enrollment rates rising more rapidly.

Kerala might be cited as a possible exception to this tendency for higher development levels to be linked to greater family planning success. A review of the fertility situation in Kerala suggests, to the contrary, that it is not an exception (Zachariah, 1983). Education levels have been higher in Kerala than in other Indian states for some time, and infant and child mortality levels lower. Around 1980 the proportion literate in Kerala was twice that in India as a whole, and the infant mortality rate less than half that of India. The investment per capita in family planning in Kerala has been at points almost as great as that in Hong Kong and in Taiwan, China. But this investment would very likely have had much less impact given a less favorable education and health situation.

Fertility Preferences

These variations in family planning program success are largely due to lower fertility preferences at higher development levels. What fertility preferences contribute to contraceptive use is simply illustrated. The average woman in most national surveys in sub-Saharan Africa wants 7 to 9 children, and contraceptive prevalence in this region is rarely above 5 percent. The average woman in Latin America and the Caribbean wants 3 to 5 children, and contraceptive prevalence consequently is rarely under 30 percent.

Family-size preferences like these are often compared to actual fertility. They seldom fit perfectly: the number of children a woman has is influenced by many factors in addition to her fertility desires, including her own fecundity and access to contraception. After describing levels and trends in preferences, this section will attempt to show that preferences are translated into appropriate fertility regulation behavior to some extent, therefore affecting contraceptive use. Then the section will discuss the roots of fertility preferences and means for affecting them, including the use of incentives and disincentives.

Levels and Trends

Family-size preferences are usually obtained by asking respondents how many additional children they want at present or how many children they would have under certain "ideal" situations, like being able to choose some exact number. Preferences also exist, though they have been less studied, in regard to spacing; women may be asked, for instance, whether they want a child within a specified period, such as two years.

Differences among developing countries are easiest to describe with reference to ideal family size, which roughly parallels the total fertility rate across regions. Among countries covered by the World Fertility Survey, women want the most children in sub-Saharan Africa, where an ideal of 6.8 is reported for Kenya and an ideal of 9 for Senegal. In both cases, a substantial number of additional women--almost 20 percent for Kenya and almost 30 percent for Senegal--did not specify any number as ideal, but answered instead that they wanted as many children as possible or would accept whatever God, fate, or their husbands decreed. Since family-size preferences probably do not take possible infant and child mortality into account (McClelland, 1983:311, preferred number of births should probably be assumed to be higher (an estimate is about 12 for Senegal) and would be even higher if those not stating an ideal would not in fact accept small families.

Only one WFS survey outside Africa showed as many women not stating ideal family sizes, and therefore appearing resigned to whatever number of children they may bear. This was the Bangladesh survey, in which, despite careful questioning (and some directive probes), 30 percent stated no numerical preference. Analysis of tape-recorded interviews confirmed that these women generally felt they had no personal choice or it was inappropriate to express a choice in the matter (Thompson and others, 1982). Among women who did state a numerical preference, however, ideal family size was much lower in Bangladesh, at 4.1, than in the African countries. Ideal family sizes comparable to those for the African countries were reported only in Jordan (6.3) and Syria (6.1), consistent with their high total fertility rates.

The remaining ten Asian countries for which ideal family size has been reported are tightly clustered between 3.7 and 4.4, except for Korea at 3.2. Similarly, ten Latin American and Caribbean countries have ideal family sizes all falling between 3.6 and 4.7 (Lightbourne and Macdonald, 1982; World Fertility Survey, 1980, 1981a, 1981b, 1982). Although ideal family size is related to total fertility rate across countries, ideals vary less. Thus ideals are below total fertility at higher fertility levels in Asian and American countries (by as much as two children in Nepal, Pakistan, and Bangladesh) and slightly above total fertility in a few of the lowest-fertility developing countries. Sub-Saharan countries are the exception to this pattern: frequently, ideals exceed total fertility rates that are themselves quite high.

Trends in ideal family size in the 1960s and 1970s in Thailand, Korea, and in Taiwan, China are remarkably similar (Knodel and others, 1982:141; Cho and others, 1982:102; Chang and others, 1981). The periods over which trends can be observed constitute the first ten to twenty years of fertility transition in Thailand and Korea, but a slightly later period for Taiwan, China where fertility transition started earlier (Bulatao and Elwan, 1984). In each case, ideal family size fell, on the average, 0.8 points per decade, from around 4 to under 3. The total fertility rate fell about twice as fast in each case, starting from different levels all clearly above initial ideals. That actual fertility should fall more rapidly is expected, since sharp curtailment of current fertility is necessary to meet falling fertility targets, given that the average woman will already have borne some children (Lee, 1980).

Preferences and Contraception

Women's fertility preferences have been shown to predict contraceptive use at least as well as, and usually better than, most household socioeconomic characteristics (Palmore and Concepcion, 1982). Instead of ideal family size, the preference measure often used in predictions is whether the woman wants another child. The proportion using contraception was as least 40 percent higher among those not wanting another child than among those wanting another child in six out of seven countries, even after other factors affecting contraceptive use were controlled (Pebley and Brackett, 1982). Similarly, prospective studies in a few countries have shown a relationship between wanting to stop childbearing and subsequent contraceptive use (for Taiwan, see Hermalin and others, 1979; some African countries are covered by Janowitz and Nichols, 1980).

In all these comparisons, it should be noted, the proportions of women using contraception despite wanting more children are not negligible. Across seven countries, contraceptors ranged between 7 and 71 percent of those wanting more children in each country (Pebley and Brackett, 1982). Presumably much of this use is for child spacing, and could be related to spacing preferences if they had been measured.

One relationship rarely studied is that between childbearing preferences and abortion; an exception is a study in Taiwan, China in which it was found that, two years after women were asked about their preferences, the induced abortion ratio per 100 pregnancies was 2.5 among those wanting more children and 23.6 among those wanting no more.

In translating preferences into fertility regulation behavior, individuals generally take account of various constraints, such as biological factors and amount of exposure to the risk of conception. In Contraceptive Prevalence Surveys, the perception that one is unlikely to become pregnant--because of a recent birth, sterility, absence of one's husband, or similar causes--is often given as a reason for not contracepting (Bulatao, 1983). Factors like these might be said to generate a "potential family size" for a given couple that figures in their contraceptive decisions. With survey data from Sri Lanka and Colombia, Easterlin and Crimmins (1982) attempted to predict how soon after marriage contraceptive use commenced, using ideal family size and a measure of potential family size estimated from factors like previous birth intervals and pregnancy wastage. They found that ideal family size was not as good a predictor by itself as when potential family size was also figured in. One may infer that the previously discussed effects of marriage timing and breastfeeding duration on fertility are taken into account, to the extent couples are aware of them, in decisions to use or not to use contraception.

As should be expected from these results, family-size preferences are related, though imperfectly, to subsequent fertility. One prospective study in Taiwan, China demonstrated that prior fertility intentions better predicted fertility over a three-year span than any demographic or socioeconomic variable (Freedman and others, 1975). In the aggregate, family-size preferences are a particularly powerful means of predicting future fertility where contraceptive use is widespread; even in such circumstances, however, predictions for individuals are seldom exact (McClelland, 1983).

Socioeconomic Factors and Preferences

One of the strongest influences on ideal family size is actual family size: the number of children a woman says she prefers depends greatly on the number she actually has (Pullum, 1983). For some women this relationship reflects the achievement of fertility goals, but for others it reflects some tendency to alter preferences in favor of children one has already borne and raised. Socioeconomic characteristics are related to ideal family size partly, perhaps largely, because of their relation to actual fertility. When actual fertility is controlled, their influence on ideal family size is much reduced (Pullum, 1983). One study which effectively held actual fertility constant by focusing only on women with three living children in 15 countries does show some negative effect on ideal family size of education and urban residence and some positive effect of husband's employment in agriculture (United Nations, 1982:194-195). A comparison of several African countries also showed education and residence to have some effect (Acsadi and Johnson-Acsadi, 1983).

On the other hand, no clear effect for education or income on family-size preferences was demonstrated in a separate seven-country study where number of living children was controlled (Bulatao and Fawcett, 1983). This study showed instead that family-size preferences relate to particular values or disvalues of children.

The Value of Children and Preferences

Such values and costs of children are presumably at the root of family-size preferences. Measures of the objective value of children in a developing country are rare, and researchers have not so far studied their relation to family-size preferences. Individual perceptions of these values and costs, however, have been shown to affect fertility preferences. In the seven-country study, the importance placed on economic contributions from children was found to be positively related to ideal family size, except in more advanced developing countries like Singapore. In Singapore, as well as in the U.S., perceptions of the restrictions children impose on parents had a negative influence on ideal family size. In all seven countries, preferences between sons and daughters and actual family composition also had a strong influence on wanting another child (Bulatao and Fawcett, 1983).

The economic contributions children can make to their families in peasant settings are varied and not easily quantified. Children contribute their own labor, in the home and on the farm, often starting at fairly young ages. It is reported, for instance, that boys of 6 to 8 in a Nepalese village spend an average of 2.6 hours a day caring for farm animals, and girls of that age, besides similar duties, spend almost 1.7 more hours a day caring for other children. The work inputs of children have also been closely observed in a village in Java, where boys 15-19 are estimated to put in 8 hours of work a day, and girls of the same age 10 hours (Nag and others, 1978). Bangladeshi children work even longer hours, but children in the Philippines and Sri Lanka--where fertility is relatively lower--somewhat shorter hours (White, 1981).

As observed earlier in discussing child employment, labor contributions from children living at home make some difference in fertility. However, they probably do not outweigh the economic costs of childrearing. This is the consensus among researchers who have studied the relatively limited evidence: even for a poor peasant family, the "average child is a substantial net drain on household resources" (Lee and Bulatao, 1983:241; Mueller, 1976, 1979; Cassen, 1978; Cain, 1982). Childrearing costs may be relatively low in such settings, but they are far from negligible to households close to subsistence levels. These costs are in fact the chief concern parents voice, even in the least developed settings, when asked about the disadvantages of having children (Arnold and others, 1975; Bulatao, 1979).

If large-family preferences in peasant settings are rational, there must be additional benefits from children, besides their labor contributions, to balance their costs. Among other economic benefits, the security children provide against destitution in old age has received some attention. In developing country surveys, substantial numbers typically expect, in their old age, to rely on their children. Between 80 and 90 percent expect to rely at least partly on sons in the Philippines, Turkey, Indonesia, Thailand, Korea, and Taiwan, China (Bulatao, 1979). (The percentages expecting to rely on daughters are just as high in the first four countries, but only half as high, consistent with strong son preferences, in Korea and Taiwan.) Given the absence of alternative investments with a positive rate of return in poor peasant settings, children may in fact be indispensable for old age security (Caldwell, 1983).

A few studies provide preliminary indications that social security coverage, which can replace dependence on children, contributes to lower fertility. Cross-national comparisons support this, suggesting in addition a feedback process in which lower fertility increases the demand for social services for the aged (Entwisle and Winegarden, 1981; Entwisle and Bollen, 1981). Comparisons of 34 municipios in southeastern Mexico indicate that an increase in social security participation from 0 to 50 percent leads to a 10 percent fall in fertility over a decade (Wildasin, 1983, citing Nugent and Gillaspy, forthcoming). The social security data used in these comparisons are generally poor, however, and the conclusions all tentative.

By itself, the desire for security in old age is probably insufficient to justify high fertility. Though old age security comes up often when people are interviewed about children, it is not certain how concerned people actually are about it. One report from an Indian village indicates that few younger men had given thought to old age, and few older men received much care from their children (Vlassoff and Vlassoff, 1980). As people live longer, greater provision for old age is necessary, but there is no evidence of higher fertility as a result. Among those who have given thought to old age, continuing to work often seems to guarantee better security. Whether children will in fact be around when needed, and if so whether they will be willing and able to help, are typically uncertain. Thus the old age security motive must be counted as only one among the many reasons for large-family preferences.

Companionship in old age may be at least as important as financial security. Other social benefits of having children include the continuation of the family name and family traditions and the security and political power that can come from large families. For instance, a large Bangladeshi family has an advantage in land disputes before the courts; a large Yoruba family in Nigeria can throw its weight around in the village. Numbers supposedly provide strength, security, and a network of allies, so that large families and powerful families often seem to be synonymous (Caldwell, 1983). Contrary to such arguments, however, a careful study in Botswana suggests that large households are no better off than small households (Mueller, 1979). Social benefits like these therefore require much more investigation.

Combining all these benefits of children and the costs they impose into a single net cost measure is a difficult exercise that has not so far been accomplished. However, it appears possible that the economic and social values of children, though individually insufficient to justify large families, together provide an adequate rationale for high fertility, particularly when the psychological rewards of childbearing (which are significant even in industrial societies) are added on.

The economic niches that children can fill gradually disappear as a society develops. Increases in industrial production, the commercialization of agriculture and the spread of landlessness, the progressive monetization of domestic activities, the demand for specific labor market skills associated with on-the-job training, literacy, and schooling--all these processes together increasingly shrink the possibilities for child employment.

As children's economic contributions decline, the psychological rewards of childbearing become increasingly salient. Among these are the love and respect parents receive, children's contribution to marital harmony, and the sense of accomplishment from successfully rearing children. Despite their importance, these motives for childbearing seldom contribute to high fertility, because they can generally be satisfied, and in fact may be better achieved, with fewer children, on whom the parents can lavish more intensive care.

The opportunity costs of having children become increasingly heavy in the course of development. Much attention has been paid to the degree to which a child interferes with its mother's employment. As has already been noted, the effect this has on fertility seems to depend on specific circumstances: what type of work is involved, how compatible it is with childcare, how demanding parenting is considered to be, and so on. The degree to which a child interferes with other activities of its parents--including leisure, social activities, and the consumption of other goods--has been much less studied but may be much more consequential. Almost no one complains of such costs in developing country surveys of the values and costs of children. The great majority in developed countries, on the other hand, do complain of these costs. Typically, also, this is much more a complaint of women than of men, though the degree to which men play a role in childrearing seems to matter. In contrast to traditional societies in which each individual's status is well-defined and relatively fixed, modern societies encourage aspirations for higher standards of living and the social rank that material possessions confers. These rising aspirations, increasingly incompatible with large families, provide a major reason for declining fertility preferences.

Not all variations in family-size preference can be adequately explained within this framework of the benefits and costs of children. For instance, preferences differ, sometimes profoundly, among religious groups, language groups, and cultural communities, even when they live side-by-side and share similar economic circumstances (Pullum, 1983; Bulatao, 1979). Some of these differences moderate as societies develop, but few entirely disappear.

Altering Family-Size Preferences

Promoting preferences for smaller families is often a central concern of population policy. Changing people's preferences is more complicated--and raises more questions relating to freedom of choice--than simply providing contraceptives. For this reason, direct attempts to modify preferences generally come only after family planning programs have had some time to work, and are often characterized as "beyond family planning" measures. Three basic approaches to promoting small-family preferences are possible:

- to rely on the process of development to change the opportunity structures and the value and cost factors that underlie preferences for large families

- to attempt to persuade couples that large families favor neither their interests nor those of the community and society
- to institute specific incentives, disincentives, or legal requirements to alter the implicit calculations couples make about childbearing

Each of these alternatives will be considered in turn.

Where development progresses satisfactorily, the economic contributions of children tend to disappear over time and alternatives to childbearing are increasingly provided. However, the fact that this is in some sense a "normal" process should not lead one to conclude that it is painless. Migration to the cities, for instance, while removing children from many of the roles they might otherwise play in peasant agriculture, might instead force them into marginal semieconomic activities--selling newspapers, watching cars, sorting garbage for usable objects--or even into crime as the only means of survival.

Possibilities for "restructuring" development to promote smaller families have occasionally been made. The emphasis might be placed, for instance, on compulsory education, to take children off the farm, or on improvements in the status of women. As earlier noted, not all development measures are equal in their fertility effects, and choice is essential. Their effects on fertility preferences in particular, as opposed to their broader effects on all fertility behaviors, often appear weak or at least tardy.

To rely entirely on development as an autonomous process, or on a restructuring of development, is, in most cases, to accept a slow, and possibly uncertain, pace of decline in family-size preferences. Governments that perceive population growth as a more urgent problem have sometimes taken more direct measures. The simplest of these is probably the attempt to encourage couples to think seriously about the costs of children, and to persuade them that large families are in fact a burden. The propaganda connected with family planning campaigns often attempts to instill ideas about appropriate family sizes, and to link smaller families with positive images of health and prosperity. Besides increasing the salience of the personal costs of childbearing, such campaigns often also emphasize the costs to society, providing couples with additional altruistic reasons for small families.

A step beyond persuasion is the application of incentives and disincentives to affect fertility preferences, including statutory disincentives affecting broad classes of people; deferred payments to individuals or households for satisfactory fertility behavior; and incentives provided on a community basis (Jacobsen, 1983).

Disincentives, generally mild, that increase the costs of large families--through limits on income tax deductions for dependent children, automatic cutoffs of child allowances and maternity benefits after a certain number of births, and similar means--have been adopted in Korea, Malaysia, the Philippines, Grenada, Ghana, and a number of other countries (Barnett, 1983). Such disincentives may be tied to number of children or to the spacing between them. For instance, Pakistan limits deductions to the first two children, whereas Tanzania allows working women paid maternity leave only once every three years.

Singapore has the most comprehensive set of disincentives, including such measures as delivery fees that rise with parity, priorities in school admission for children from smaller families, and public housing allocation policies that explicitly disregard family size. Attitudinal studies suggest that these disincentives, and particularly the school admission policy, are much more influential in Singapore than the more common tax and maternal leave disincentives, which in practice affect few people (Chen and Fawcett, 1979:202). Disincentives were introduced gradually in Singapore beginning in 1969, over a decade after the start of fertility transition. The timing and pattern of fertility decline after their introduction suggests that they had some impact (Anderson and others, 1977).

Among schemes to provide deferred payments for small families, the two best known are the education bonds introduced in a Taiwanese community in 1971 with Population Council support and the "No-Birth Bonus Scheme" started in the same year by the planters' association on three tea estates in south India. In the township of Hua in Taiwan, China education savings accounts were set up with annual deposits of roughly $15 for families with two or fewer children. Families with three children received less, and families who had a fourth child lost their accounts. Payments were calculated to eventually provide three-fourths of the cost of high school education for two children (Finnegan and Sun, 1972; Wang and Chen, 1973). On the Indian tea estates, each woman worker had an extra day's pay credited to an account each month she was not pregnant. Benefits were suspended for a year for each pregnancy, and, for pregnancies beyond the second, a substantial portion of the account was also forfeited. At retirement, the couple could use savings in the account for such purposes as acquiring a plot of land (Ridker, 1980).

Each scheme was estimated to cover its costs and produce some saving, because of reduced educational costs, in the first case, and reduced child care, medical, and work loss expenses, in the second. The operation of each scheme coincided with a decline in fertility, though a large part of this could be attributed to other factors. Both schemes elicited positive responses: 67 percent of those initially eligible enrolled in the educational savings scheme, 61 percent in the No-Birth Bonus Scheme. Hua, however, became incorporated into a neighboring city, and the fertility reduction specifically from the educational savings scheme was difficult to sort out. The No-Birth Bonus Scheme did appear to reduce fertility more where it was introduced than in other tea estates without the scheme, especially if only the target women were considered. Fertility was falling roughly in parallel across the tea estates, and, where it was adopted, the scheme appears to have accelerated the decline.

Incentives provided to individuals need not of course be deferred, nor need they be direct cash transfers. Community-Based Family Planning Services (CBFPS), a private organization, has experimented with a variety of income-generation schemes linked to family planning in Thailand (David, 1982). Family planning acceptors have been assisted in the marketing of agricultural products and handicrafts, given credits for livestock, feed, and construction materials, and provided with fertilizer, seed, or garlic, dressmaking, hairdressing, or drugs at reduced prices. In some communities they have also been allowed to use a "family planning bull" for stud service or given assistance in raising pigs. These incentives are often tied to contraceptive adoption, but may also be tied more generally to avoiding pregnancy. Providing such incentives requires some sensitivity, to avoid the image of needlessly depriving poor households of important resources. In the contract pig-growing program, for instance, a woman is provided a piglet to fatten, over a period of eight to nine months, and given a share of the profits. Should she become pregnant the pig is not taken away, but she may lose the opportunity to receive another pig in the future.

Small-family incentives may also be provided to communities as a whole. Prizes and popular recognition for meeting fertility targets, or performing better than other communities, may be used. More substantively, attempts may be made to increase community incomes while introducing fertility control. The government may reward a community with a biogas plant; a cooperative store; a fish and duck pond, plant nursery, breeder pigs, and other elements combined into an appropriate technology center; and other types of public works. These specific ones have been used in Thailand by CBFPS. As with individual incentives, careful design is necessary to avoid any image of unfairness. A project involving community incentives was originally planned for several villages in Indonesia. Those villages where 35 percent of couples practice contraception were to receive grants for public works projects and loans for income-generating activities. Partly because of protests about a previous scheme in which incentives went to family planning service providers rather than acceptors, the community incentives scheme was substantially altered before implementation. The family planning targets were dropped, and grants and loans are now being provided to the selected villages regardless of fertility performance. Family planning targets are being worked out at the same time with the community, and acceptor clubs or mothers' clubs control the money for income-generating projects, so that some link to fertility control has been maintained. However, the project no longer specifically involves incentives (Jones, 1984).

Apart from changes in tax laws and maternity benefits, incentives have been tried mostly in situations where fertility was already falling. They do appear to have accelerated fertility decline in a few cases, as on the Indian tea estates; whether they would have a similar effect in adverse conditions is more doubtful. The viability of the deferred payment schemes rests not only on public confidence in institutional ability to eventually provide payments but also on the childrearing costs that are avoided. If most of these costs can be avoided anyway because of falling fertility, the argument for the schemes loses some of its force.

Incentives are supposed to reduce fertility by altering the costs and benefits couples attach to childbearing. They also have other consequences that are at least equally important. In analyzing the effects of Singapore's disincentive policies, Fawcett and Chen (1979) distinguish three possible types of effects: to educate people about the government's population policies; to encourage or facilitate rational decisions about childbearing; and to serve as barriers to large families among those inclined toward them. These disincentives had the expected educational effect, and similarly facilitated consideration of the costs and benefits of family size, but were not necessarily major influences on family-size decisions. They were largely ineffective as barriers: couples that wanted many children continued to have them. Although incentives and disincentives have potential impact on fertility preferences, they may have a larger role in communicating a government's seriousness about population control.

CONCLUSION

Starting from the premise that population growth rates threaten development efforts, an attempt has been made here to unravel the determinants of fertility and to draw appropriate implications for population policy in developing countries. The worldwide declines in fertility are seen as part of a natural process, the demographic transition, through which developed countries passed late in the 19th century and through which developing countries are now passing, over varying periods and at varying speeds. That this process is natural does not mean that it is totally predictable; many forces in the demographic transition have been identified, but their relative strength and their interactions are in some cases still poorly defined. That it is natural also does not mean that the process is uncontrollable; appropriate interventions can hasten or retard decline.

In the long run the effect of development in making large families undesirable and therefore moving couples to control their fertility is what leads to completion of the fertility transition. However, the effect of development is not uniformly positive. In the earlier stages of the movement from pastoral or peasant to industrial societies, improvements in health are likely to lead to reductions in sterility, and other social changes to shorter durations of breastfeeding and postpartum abstinence, which tend to raise fertility. As development progresses further, marriage delay often counteracts these pronatal effects, and the diminishing economic advantages and increasing inconvenience of large families lead to greater use of contraception and abortion, eventually bringing fertility down to modern levels.

The entire process takes a long time. At the rates of decline exhibited by different developing countries, between 15 and 50 years may elapse between the start of the fertility transition and its completion, and further time must be added because many countries, especially in sub-Saharan Africa, have not even started the process. In the case of Zaire, the difference between a 15-year fertility transition and a 50-year fertility transition, assuming an immediate start, would be the difference between a population in the year 2030 of 62 million or 105 million. An immediate 15-year transition would also mean a much smaller proportion of dependents by 2030, only 30 percent instead of 37 percent under a 50-year transition. Much interest centers, therefore, on the question of how to accelerate the fertility transition, and how to get it started where it has not begun.

Policy Options

The two basic, and complementary, approaches outlined were to focus on specific development policies with the greatest potential for reducing fertility and to provide programs and services to directly affect specific fertility behaviors. The most promising development policies were earlier summarized. Very briefly, improvements in education--especially for women--and better health are critical. Income improvements are less central to fertility decline. It is not the ability to afford new goods but aspirations for them that influence parents toward having fewer children. Modern-sector employment for women possibly, and less child employment certainly, favor lower fertility.

With regard to programs, the approaches outlined included family planning programs to provide safe and effective methods of contraception and abortion at low cost; educational programs to promote breastfeeding, combined with controls on the marketing of breastmilk substitutes and various other measures to make breastfeeding more convenient; broad social programs to raise the status of women, which is essential to prevent early marriage; and the use of propaganda and incentives and disincentives to encourage preferences for smaller families.

Which approaches require emphasis vary from region to region and from country to country. Cultural and political factors have to be taken into account, as well as the welfare effects of different policy options. Focusing narrowly on cost-effectiveness, it is possible to contrast two major options: family planning programs and development interventions, especially increased education and reduced infant and child mortality. This contrast, it should be clear, ignores the many other social benefits these interventions produce, focusing only on fertility effect.

Rough estimates, based on relatively weak data, of the cost-effectiveness of different interventions have been made. Drawing on previous research to determine marginal fertility effects and making various assumptions about program costs, Simmons (1979) concluded that family planning programs were at least seven times as cost-effective as nutrition programs or rural education programs for women. A cross-country study using data on fertility determinants and family planning program costs in sixteen countries found that family planning programs prevented a birth at one-seventh or less of the cost of programs to reduce infant mortality. In the Philippines, Indonesia, and Mexico, for instance, the cost per birth averted through family planning programs was somewhere between one-tenth and one-thirtieth of the cost of births averted through mortality reduction (Cochrane and Zachariah, 1983). The cost-effectiveness of education for averting births was no better than that of infant mortality reduction; primary education, in fact, sometimes has a positive effect on fertility, though secondary education has a more consistent and somewhat larger negative effect (Prescott, 1984).

Fertility reductions from these measures occur at different points in the future. The effects of mortality reduction and family planning programs (should they have any effect) are fairly prompt. The effects of maternal education, on the other hand, inevitably involve long delays: whether maternal education raises age at marriage or reduces marital fertility, the lag is several decades between commencement of schooling and fertility reduction. Such delays mean an absence of any effect on current growth rates and a larger population by the time fertility reductions are felt. Maternal education may also lower the costs of child schooling, with more immediate effect, but reliable estimates of the magnitude of this are not available. When discounting is applied to allow for delay in fertility effects, the cost-effectiveness of education becomes considerably worse (Prescott, 1984).

Effective family planning programs depend, of course, on adequate human and institutional resources and sufficient public concern about fertility regulation, and therefore cannot be divorced from other development measures. These interventions are complements rather than substitutes. For example, at very low levels of education and high levels of mortality, the effectiveness of additional expenditures on family planning may be low because interest in the service is lacking. Where family planning programs have had little success, as in Kenya and Nepal, reductions in infant mortality and increased education appear relatively more cost-effective. One estimate for Kenya is that the cost of averting a birth through health programs is under half the cost of averting a birth through family planning (Cochrane and Zachariah, 1983; Prescott, 1984). The same increase in family planning expenditure in a high education-low mortality setting might induce a much greater increment in contraceptive use. The general conclusion remains, nevertheless, that family planning programs are by far the most cost-effective intervention, if one focuses solely on the fertility effects, in virtually all circumstances.

Prognosis

Would effective family planning programs, together with the other measures discussed, be adequate for hastening fertility decline? The situation varies from region to region. In many countries of sub-Saharan Africa, for instance, the prospects are strong that fertility will rise in this decade, with reduced sterility and shorter durations of breastfeeding and postpartum abstinence. Family planning programs and related development measures may partly offset this rise, though there is little likelihood that they will produce immediate fertility decline.

The adequacy of these measures might also be questioned for countries in which initial fertility declines stalled and were followed, for a few years at least, by constant or even rising fertility. Such stalls have been reported for countries like Sri Lanka, Costa Rica, Korea, and Taiwan, China The reasons for a stall appear to be different in each case: somewhat earlier marriage because of improved economic conditions in Sri Lanka, as well as failures in delivering contraceptive services; deterioration in the national family planning program in Costa Rica, combined with a weakening of political support; continued strong son preference in Taiwan and concern with having a son to provide for one's old age; and shorter birth intervals and shorter breastfeeding durations, as women increasingly pursued their own careers, combined with persisting son preference, in South Korea (Gendell, 1984).

This variety of reasons suggests the need to attend to each of the behavioral determinants of fertility, as well as to the political, institutional, and economic basis for effective fertility control. It also indicates a need for flexible and responsive fertility control programs to deal with the continually changing concerns of individual households.

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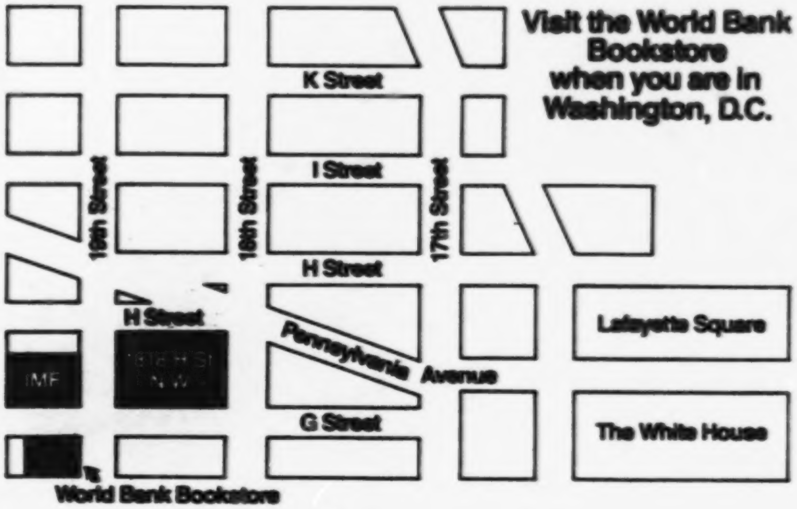

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